SCIENTIFIC AMERICAN

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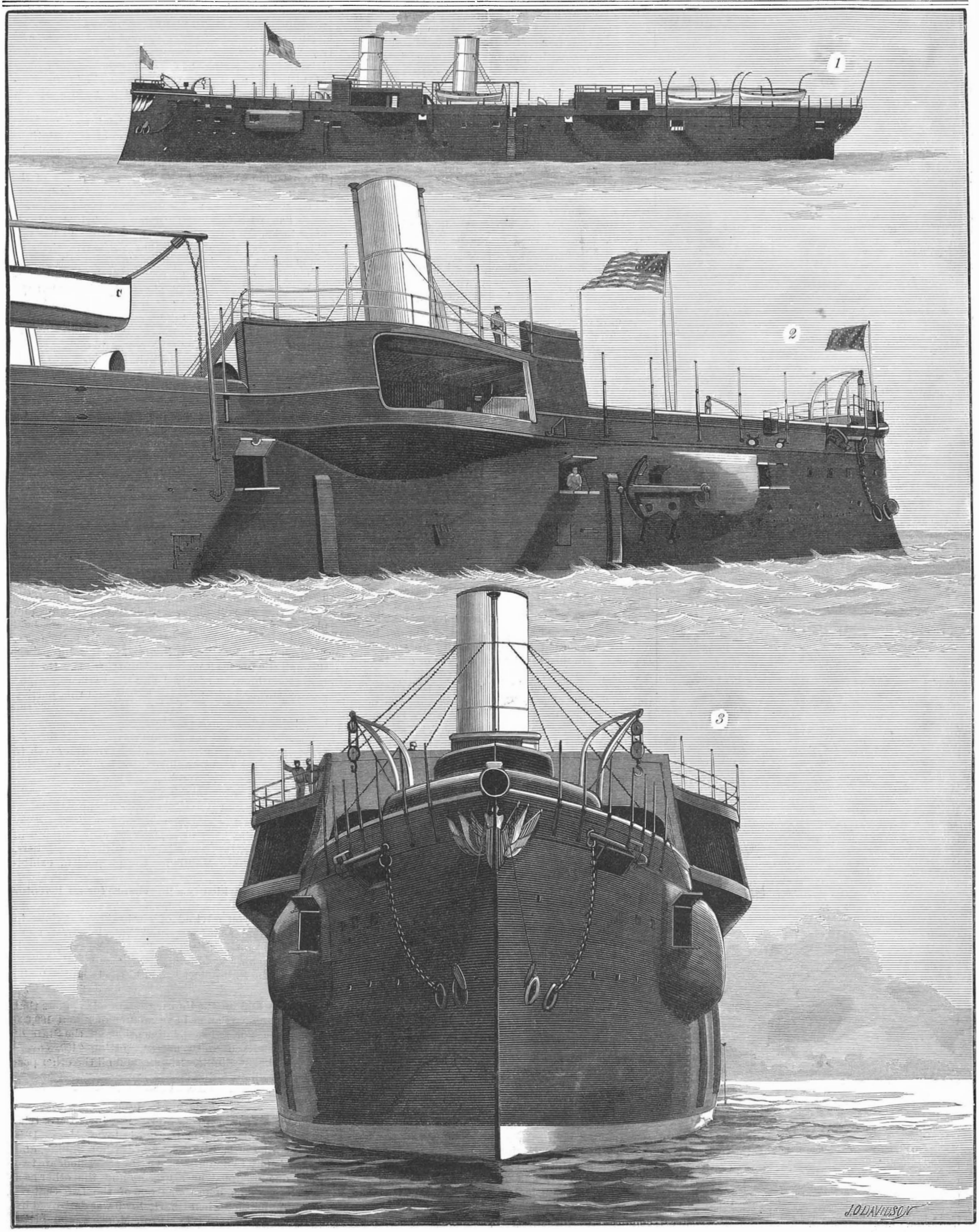

1. Side Elevation of the Chicago. 2. Side View of the Bow of the Chicago and Gun Bay. 3. Stem View of the Chicago.

ILLUSTRATIONS OF THE NEW AMERICAN WAR SHIP CHICAGO.—[See page 180.]

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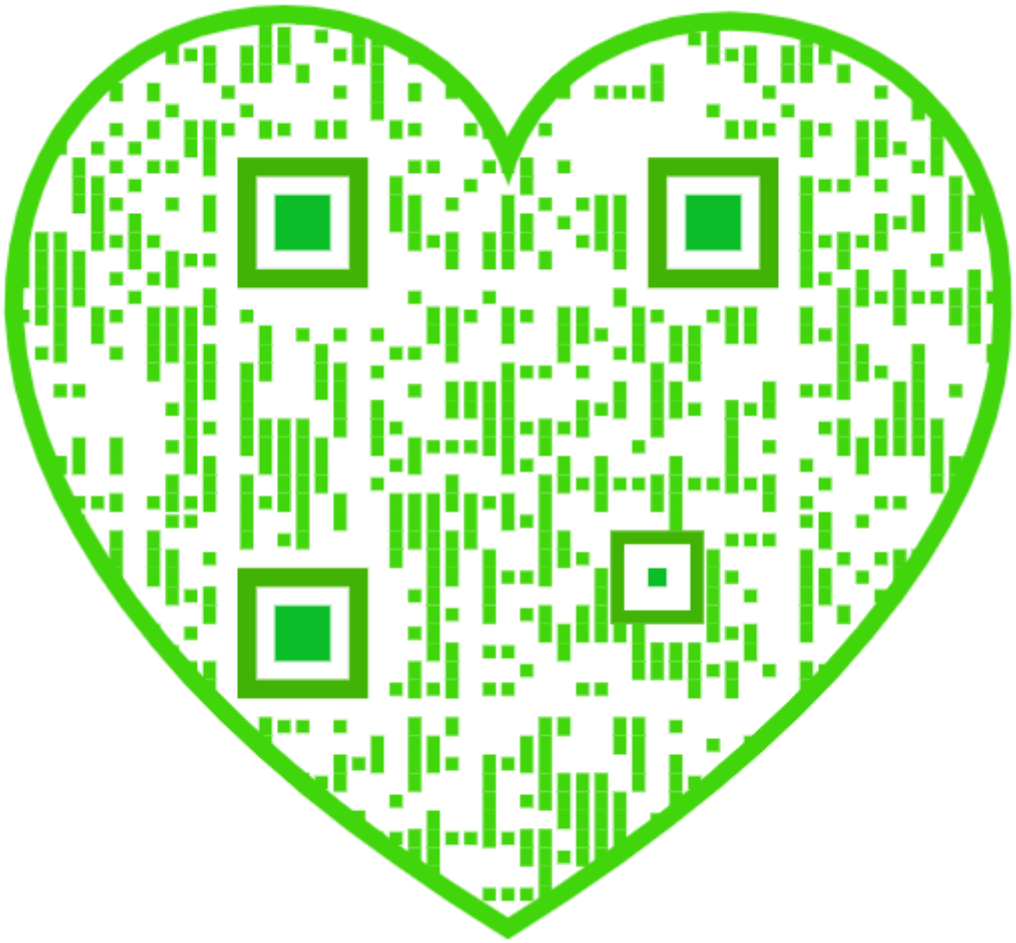

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NEW YORK, SATURDAY, SEPTEMBER 17, 1887.

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ELECTRO-MOTOR BATTERIES.

Prof. Reckenzaun's paper on storage batteries for locomotion was the most important of those read before the recent meeting of the National Electric Light Association. Reckenzaun has, perhaps, had more practical experience with the electro-motor on land and sea than any other man on either side the water. This alone would have drawn attention to his paper, but the fact that he is carefully accurate in statement, a characteristic unhappily rare in some departments of science, lent to it additional importance. We are often told that figures don't lie, yet those who have had frequent recourse to figures will recall how often they have been deceived by them. Once you start with a false premise, and figures will lead you whithersoever you list; just as if we let $a=1$ and $x=1$, it may be shown that $1=2$ and $2=0$. The tendency of most experimenters with commercial leanings is to exaggerate, and it is not easy to recall any department of applied science where there has been more exaggeration than in motors. More than one projector has declared that the cost of running a motor is as the cost of maintaining a single horse per diem. Their figures invariably sustained the assertion, and it must have seemed strange to many, this being the case, that the surface street car companies, at least, did not adopt them. The fact is, practical experiment, so far, has scarcely warranted the claims set up by the promoters, and while all admit the peculiar adaptability of electricity to motors, a belief prevails that still more experimentation is required to make the motor altogether reliable.

Prof. Reckenzaun's figures, based upon actual experiment, show that cars may be run by storage battery cheaper than by horses, but that the equation of uncertainty of action is, at present, larger in any consideration of electric transit than in that of horse transit. Already, he thinks, electricity furnishes an economical and practical means of street locomotion, and he adds the opinion that, because of the interest taken in the matter here, we are likely, a twelvemonth hence, to be far in advance of the old world, both in point of perfection and use of electro-motors.

An interesting portion of the paper is where its author points out the fact that because it requires only one or two horse power to propel a loaded car on a plane surface, it is not an indication of the presence of sufficient power. It may take from twelve to sixteen horse power to pull that same car up an incline, and two average car horses are capable, on demand, of exerting that power for short periods. In other words, the batteries used should be equal in strength to the maximum power required, just as the service required of a chain should not call for a strain greater than its weakest link is capable of withstanding. The reader must not conclude from this that batteries far more powerful than what is required to draw a loaded car along a plane surface are necessitated on grade. This, fortunately, is not the case, because the storage battery may be discharged in any quantity up to its whole capacity, whether this be one ampere or one hundred; and it is, therefore, as easy to get twenty horse power as to get one, remembering, of course, that the battery, like a pitcher of water, has less remaining the more is taken out. We are told that the electrical apparatus required to run a car is one-fifth the weight of car and passengers, the current needed being in the neighborhood of thirty amperes and E.M.F. of 180 volts.

Reckenzaun once placed a dynamo between a loaded car and the two horses drawing it, so as to ascertain with exactness the amount of pull, measured in pounds measured by the distance traversed in a minute. At the easiest work the horses exerted from two to three H. P. Experimenting in Philadelphia, he found that an ordinary horse was capable of exerting eight H. P. for a few moments. It is because of their being called upon to withstand these sudden strains that car horses can be used only from three to four hours a day. A few weeks of longer hours would, he thinks, kill them; whereas, if run two hours a day, they would last three or four years. He computes this to be 33,000 foot pounds per minute per H. P. The question between cable and electrical traction is an interesting one, the more so because of the many conjectures recently indulged in, some of them, based on fact, having differed widely. Reckenzaun says he has found the waste of power on a cable road to be quite 80 per cent. He referrs in this principally to the power required to work the cable itself, independently of the additional power required to haul the cars. The cable road construction in Philadelphia cost, he says, $100,000, and that in San Francisco still more. He admits that there is also a waste, and a large one, in the storage battery motor system; a waste of energy in the dynamo, again in the accumulator charged by the dynamo; in the motor driven by the accumulator, and finally in the gearing for reducing the speed of the motor to the speed required by the car axles. Regardless of some of the wild assertions that have been made as to the accuracy of the apparatus, Reckenzaun says that in the present condition of the storage system not more than forty per cent of the power collected from the steam engine and applied to the dynamo can be recovered in work. But this, he says, makes the storage battery system cheaper than horse traction.

Prof. Reckenzaun, like many others, is a believer in the future of the so-called storage battery. It is yet in the state of experimentation, and there are those who believe that the present compares with that of the future scarcely more favorably than did Watt's kettle with the steam engine of fifty years later.

An Invention Wanted.

A very interesting exhibition is now in progress in Madrid, being a display of the products and industries of the Philippine Islands, which are among the largest and richest of the colonial possessions of Spain. Our correspondent in Madrid writes as follows:

An opening offers just at present to inventors, as a machine is wanted by the planters of the Philippine Islands for preparing the abaca flax for market and exportation. This is the plant from which the fiber known as Manila hemp, and used in making Manila rope, is obtained.

On the 18th day of August, a trial was made at the exhibition, in the presence of one of the ministers of the crown, of a machine sent here from Manila by the society styled "Sociedad Economica de Manila." The machine was tried in competition with one of the Indian native workmen. It did not give satisfaction, as the man got through his work faster and produced more flax, with less waste, than the machine did. It must be stated, however, that the inventor of the machine was not present, and that the native workmen who tried to work the machine did not know how to manage it properly. Some of the Philippine planters and estate owners present stated, however, that the machine did not fulfill their requirements, and they were still anxiously waiting for a better one.

The Madrid daily paper *El Imparcial*, in its number of August 17, stated that the aforesaid society—"Sociedad Economica de Manila"—had decided to offer a prize of two or three thousand dollars (the *Imparcial* understood) to the inventor of the best machine for preparing the abaca for market. Speaking recently to some of the said planters on this subject, they informed me that the person who should present to them a good machine, suitable to their wants, would make a fortune out of it in the Philippines, as they, the estate owners, are at present entirely at the mercy of the coolies, and they are only able to utilize 25 per cent of the plant, the other 75 per cent being wasted.

The operation which the machine is required to do is that which the coolies perform by hand in the field, just as they cut down the plant. The coolie, having cut down the plant at the root, lops off the top and proceeds to strip the trunk. He takes out a series of strips about 2 inches wide and some 5, 6, or 7 feet long, according to the length of the trunk. He then takes these strips or ribbons to a rude wooden frame, and placing one between a pair of knives or shears, held down by a treadle, he pulls the ribbon, by main force, through the knives, and the part which has thus passed through the knives is converted into threads. He then turns the ribbon end for end, and passes the unscraped portion through the knives as before, and this portion is also converted into threads He then hangs the handful of thread on a pole to dry.

The above is what the machine is required to do. As I do not know what attention may have been given to this subject by American inventors, I merely mention this matter to you as a preliminary step.

I inclose you a bit of the fibrous material (the strip or ribbon alluded to) and a sample of the flax taken from it. Both the ribbon and the flax threads were recently forming part of a plant growing in a tub in the park here, the plant having, with many others, been brought from Manila for the purpose of exhibition and trial.

Now there is evidently a fine chance for an inventor here.

I will keep you advised of what takes place here in this connection, as it is expected that the government will probably offer a prize too. The sale, however, which a good machine would meet with among the estate owners in the Philippines would be the best prize for its inventor. JOHN SHAW.

[We may add for the information of our readers that the Philippine Islands have an area of about 100,000 square miles, or twice the dimensions of the State of New York. A Spanish patent, costing $100, covers Spain, Cuba, Philippine Islands, and all the other possessions of Spain.—EDS.]

Birthplace of Morse.

The birthplace of Prof. Morse, the inventor of telegraphy, is still standing in Charlestown, Mass. It is on the corner of Main Street and Hathon Square, and is occupied by two families. On the street floor are two stores, one occupied as a grocery and the other as a shoe store. This house was one of the two that remained unharmed when Charlestown was destroyed by fire by the British in 1775. Prof. Morse was an artist of some merit, and on the walls of several of the rooms are to be seen sketches in oil from his brush.

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The Manhattan Bridge, New York.

If work on the Manhattan Bridge, as the new stone and steel structure over the Harlem River at One Hundred and Eighty-first Street, New York, has been officially named, continues to be pushed as has been done thus far, there is little doubt that the bridge will be open for traffic within the time specified, that is, by June 20, 1888. It is a year since the project was started, but already the work is more than half done. The three main piers are ready for the metal superstructure; in fact, the massive steel pedestals which distribute the thrust of the arches upon the piers are now being placed in position. Of the 7,000 tons of steel and iron that the bridge will require, considerably more than half has been already cast, and last week the erection of the timber staging for carrying the arches during construction was begun.

The energy displayed by the contractor, Miles Tierney, who does the masonry, and the Passaic Rolling Mill Company, of Paterson, whose contract includes all the metal work, will be better appreciated by a brief examination of the labor involved in the undertaking, and especially in the portion of it accomplished. The bridge is 2,375 feet in length and 151 above the water, or over a third longer and about 50 feet higher than High Bridge. It will consist of two steel arches of 508 feet span each in the clear; three granite piers, each 40 feet thick at the springing line of the arches, and two abutments of masonry. The abutment on the east side of the river is 342 feet long, that on the west side 277 feet. Through each of these three arched masonry passages, 60 feet in width, will run. These land arches were not contemplated in the original plan, which had instead solid blocks of masonry. The change certainly makes a marked improvement in the architectural appearance of the structure.

The masonry, as stated, is already far advanced. The most difficult portions of the work are finished. Of these, perhaps the most important, and that which deserves special notice, is the great pneumatic caisson upon which pier No. 2, on the east bank, right at the water's edge, is founded. In its general dimensions this ranks third among the American bridge caissons, the one on which was built the New York pier of the East River bridge being the largest—172 by 102 feet. From out to out of sheeting the Manhattan caisson measures 104 feet in length, 54 feet in width, and is 13 feet in height from the bottom of the shoe to the top of the deck. It is built entirely of yellow pine timber, 12 by 12 inches, squared and tarred timber, and contains 520,000 feet of wood and 50,000 pounds of metal work. The shoe of the caisson stops at a point 40 feet below mean high tide, resting directly upon solid rock. After the point was reached at which it was decided to stop the caisson, the rock surface was carefully cleared of all debris and the entire working chamber and shafts filled with concrete. This was completed about May 1. Since then the mason work has progressed so rapidly that now enough is finished for one to get a fair idea of the appearance of this part of the bridge. The stone used is Maine granite, massive in size and remarkably well laid.

While Mr. Tierney has been pushing his part of the undertaking, the contractors for the metal superstructure have been equally active. An entire new plant of machinery had to be constructed for handling the immense segments of which the steel arches are composed. There are thirty-four of these segments in each rib or arch and six ribs in each span, making 408 segments in all. Each of them weighs about 10 tons and is composed of steel plates, curved to give the arch the form of a parabola. Upon these arches will rest wrought iron columns, thoroughly braced together and supporting the roadway above. The floor system of the roadway consists of transverse iron floor beams, resting on these columns and carrying the longitudinal iron stringers, which are entirely covered with wrought iron buckle plates. This gives the structure a solid iron floor, upon which will be laid the sand, concrete and granite blocks of the roadway. The roadway proper will be 50 feet wide, with sidewalks on both sides 15 feet in width. Within a few weeks the rolling mill company will have two or three hundred hands at work stringing the arches. This will take up most of the winter.

Mr. Tierney is to receive $1,210,000 for the stonework. The rolling mill company's bid was $845,000, thus making the total cost of the bridge $2,055,000, and there is little reason to think that it will exceed this sum. As is generally known, the work is in the hands of a commission consisting of Jacob Lorillard, Vernon H. Brown, and David J. King. William R. Hutton is their principal engineer. The resident engineer is John Bogart. Mr. Tierney superintends his portion of the work personally, though he has two or three assistants. The engineers of the rolling mill company are F. H. Leers, Thomas C. Spence, and St. John Clark. James Yeardley is the superintendent of construction.

Steel arch bridges are still a novelty in this country, although the one at St. Louis has been opened several years. Hence, it is not surprising to find that the Manhattan is attracting considerable attention on the part of engineers. There were a number of them looking at it the other day, when Mr. Fteley, the consulting engineer of the new aqueduct, called attention to a somewhat remarkable fact. "Did you ever notice," he said, "how many important pieces of engineering are to be found within a radius of half a mile from High Bridge? First, High Bridge itself, a model work of its kind, with the old aqueduct running over it. Then there is the siphon of the new aqueduct under the river, which will soon be completed. Besides may be named the New York City & Northern Railroad, the elevated road and drawbridge just below here, the cable road just over the hill, and lastly the Manhattan Bridge itself, a conspicuous example of modern engineering skill."—*New York Tribune.*

Wood Pulp Pails.

The pail is entirely in one piece and without hoops, so it never leaks or falls to pieces, besides being lighter by far than any other material from which such vessels could be made.

The process of their manufacture is thus described in the *Railway Review:* The wood, preferably spruce, although any soft, fibrous wood will answer, is first cleared of its bark and cut to a length uniform with the grindstone to be used, generally 16 to 24 in. It is then placed against the face of a rapidly revolving grindstone, the grain of the wood being in a line with or parallel with the axis of the stone, and a hydraulic or worm screw piston keeping the wood constantly pressed against the stone. The result, which is washed off the stone by a shower of water, after being screened of slivers and sawdust, is a milky white liquid. With the water sufficiently extracted this is the wood pulp used in the manufacture of paper and indurated fiber ware. The process of manufacture of ware from the pulp is exceedingly simple, and is similar in all the lines made by the company. In making a pail, for instance, the machine for first moulding the pail from the pulp is provided with a hollow perforated form of cast iron, shaped like the inside of a pail, and covered first with perforated brass and then with fine wire cloth. This form, worked by a hydraulic piston, is pushed up into a large cast iron "hat," which fits over it very tightly. Within this hat is placed a flexible rubber bag, and between this and the inner form first mentioned is admitted the pulp, still in a liquid state. The pulp being pumped in under pressure, the water immediately begins to drain off through the wire cloth and perforations, and the rubber bag swells until it fills the hat. The supply of pulp is then shut off, and water under high pressure is admitted within the hat and outside the rubber bag, thus squeezing much of the water from the pulp. After standing some eight to ten minutes the pressure is shut off, the inner form lowered, and the pulp pail removed. At this stage the pail is still nearly fifty per cent water, but is sufficiently strong to allow handling. This water is first all dried out in dry kilns, and then the pail is turned off on the outside with a gang of saws. After sandpapering inside and out the pail is ready for the treatment house, where it is charged with a waterproofing compound which permeates thoroughly the material of which the pail is made. Baking in ovens at a high temperature succeeds each dip or treatment. The polish which the goods present is described as being the result of the final treatment. After this the handles are riveted on the goods, which are then ready for the market.

Freezing Fish for Market.

For very many years in Russia and in other cold countries fish and meats have been frozen for market by exposure in the open air or by freezing them *en masse* in ice. In Thibet, as early as 1806, the flesh of animals was preserved frost dried—not frozen—and in that condition would keep, without salt, for several months.

In the United States ice was first used for the preservation of fish about the year 1842, and in 1845 fishing vessels began to take ice to preserve their catch. At first they were careful to keep the ice separate from the fish, piling it in a corner of the hold, but they soon began packing the fish in broken ice. The inland trade in fresh fish had, up to that time, been very limited, but soon increased, and it was not many years before boxes of fish packed in ice were shipped far inland.

The trade in fish frozen by artificial means began about the year 1861, when Enoch Piper, of Camden, Me., obtained a patent (No. 31,736) for a method of preserving fish or other articles in a close chamber by means of a freezing mixture having no contact with the atmosphere of the preserving chamber. The patent was issued in March, 1861. Mr. Piper states that the most important application of his invention is for the preservation of salmon, which had heretofore been preserved in a fresh state only by being packed in barrels with crushed ice, which on melting had moistened and injured the fish. The ice, it was said, could not keep the fish more than a month, whereas by the new method they could be kept for years if need be. The apparatus used is described as a box in which the fish are placed in small quantities on a rack. The box has double sides filled in between the sides with charcoal or other non-conducting material. Metallic pans filled with ice and salt are set over the fish and a cover set over the box. About twenty-four hours were required to complete the freezing, the freezing mixture being renewed once in twelve hours. "The fish may afterward be coated with ice by immersing them in iced water or by applying the water with a brush. They may then be wrapped in cloth and a second coating of ice applied, or they may be coated with gum arabic, gutta percha, or other material to exclude the air and to prevent the juices from escaping by evaporation." The fish are then packed closely in a preserving box, which is without a cover, but within a covered box, the space between the boxes being filled with charcoal or other non-conductor. Metallic tubes pass through the inner box for the introduction of the freezing mixture, a small pipe connecting with the lower end of the tubes to carry off the brine. The combined area of the tubes is required to be one fifth the area of the inner box in order to keep the temperature below the freezing point.

Numerous and complex methods of fish freezing have been invented and more or less practiced since Mr. Piper obtained his patent. The latest improvements are the simplest and perhaps the most effective.

In 1869 Mr. William Davis, of Detroit, patented a freezing pan for fish, which he describes as a thin sheet metal pan or box, in two sections, one made to slide over the other, the object being to place the fish or meat in one section or part and to slide the other part over it and in close contact with the articles to be frozen. The boxes are then to be piled in a large, close wooden box, the double sides of which are filled in with charcoal or other non-conducting material. Ice and salt is packed over and about the metal pans. In from thirty to fifty minutes the contents are frozen solid and may be taken from the pans and packed in the keeping chamber, where the temperature is constant at 6° to 10° below the freezing point.

Mr. Davis in the same year obtained another patent for a preserving chamber, which he says may be a room or box of any desired form. It has double walls, with the intervening space filled with a non-conducting substance. Within this are metal walls of less length than the outside walls, so that between the two a freezing mixture may be placed. Entrance is obtained through the top or side by closely fitting doors or hatches.

Other methods have been practiced, such as putting the fish in rubber bags or in other waterproof material and packing them in ice and salt. One method is described as a series of circular pans, seven in number, of such dimensions as to fit in a barrel, and in these pans the fish are frozen. In 1880 Mr. D. W. Davis obtained a patent (226,390) for packing fish and finely crushed ice in a barrel and freezing the same solid, the fish being so stowed as not to come in contact with one another.

In Boston, New York, and other cities entire buildings of three to five stories or floors are now made into fish freezers and cold storage for fish. The most common method of producing the cold air requisite for freezing is by the use of ice and salt in metallic chambers or large tubes, which pass perpendicularly through the freezing room. The freezing room is provided with double walls interlined with some non-conductor. The fish are either hung on hooks or spread on shelves until frozen, when they are removed to the cold storage rooms and kept for months, if need be, before marketing.—*A. Howard Clark, Bulletin U. S. Fish Commission.*

Metals in Plants.

Prof. R. W. Raymond gave to Mrs. Ellen Richards, of the Massachusetts Institute of Technology, some somewhat broken specimens of *Eriogonum ovalifolium* which he had exhibited to the institute, as a plant growing in silver ore localities. Most of them had rose colored blossoms. On one or two the blossoms were yellow. Mrs. Richards has since reported to me the following interesting results of chemical analysis. In consequence of the views above suggested as to the possible significance of color, the pink flowered plants were treated separately. The specimens were cleaned as completely as possible from earth; but this separation could not be made perfect, because the earth adhered in particles to the woolly leaves, as was proved by the subsequent detection in the ash of scales of bronze mica. The plants lost 6 per cent of moisture on drying at 100° C., and yielded 12 per cent of ash, of which 4·8 per cent was soluble in acid. This soluble portion contained in 100 parts, SiO_2, 2; Al_2O_3 (Fe_2O_3), 24; CaO, 26; MgO, 1·5; alkalies, as chlorides and sulphates (mostly K_2O), 27·8 parts. *The presence of arsenic was qualitatively proved in the plants*, and the earth was found to contain a considerable proportion of it, but silver could not be found. *In the plants with yellow flowers arsenic was not found.*

These results need to be confirmed by further experiment upon larger quantities and under more favorable conditions, but they are certainly striking and suggestive.

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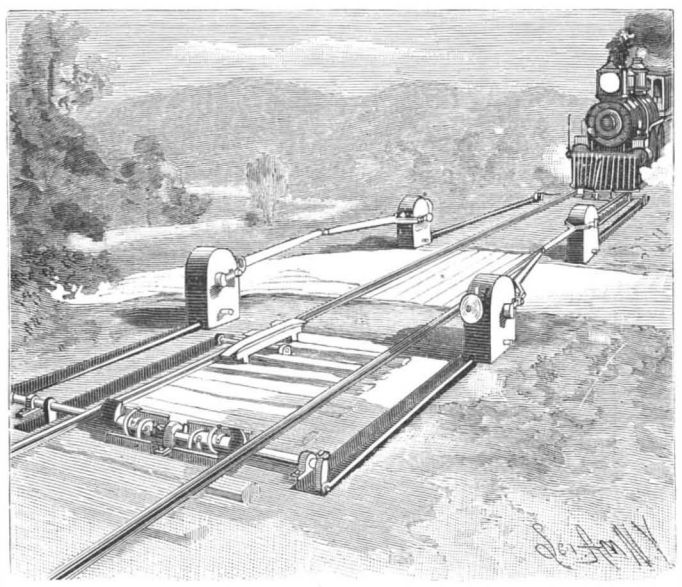
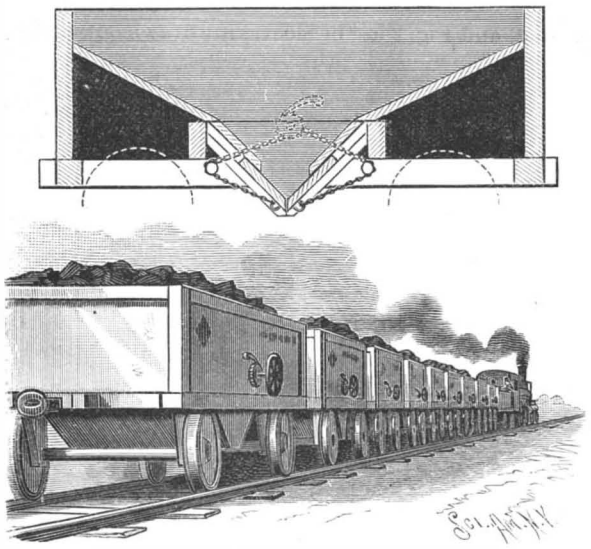
AN AUTOMATIC RAILWAY CROSSING GATE.

A gate for closing common roads where they cross railway tracks, and which is automatically opened and closed by trains passing either way, is shown in the accompanying illustration, and has been patented by Mr. George W. Housel, of Bloomsbury, N. J. The invention covers a novel construction and arrangement of trip devices, and lever and tread plate and danger signal operating mechanism, which are the same approaching



HOUSEL'S AUTOMATIC RAILWAY CROSSING GATE.

each of the gate posts and barriers of a double track railway, for which four separate sets of tripping mechanism are required, a single track railway requiring but two sets. A shaft is journaled transversely of the track at some distance from each post and its barrier, a crank arm fixed to this shaft being connected with a rod or bar connected at its other end with an elbow lever operating a gear wheel in the post. Sleeves fitted loosely on the shaft, and provided with springs, connect it with trip arms, by which the shaft is operated by the wheels of an approaching train, in connection with a tread bar, which has sloping or beveled



DAVIS' DUMPING CAR.

ends, and which is long enough to cause it to be always depressed by the car wheels of a passing train. An approaching train first strikes a distant trip arm, which sounds a gong signal, and next actuates the trip arms in connection with the shaft journaled transversely of the shaft, whereby the barrier is lowered, the connection with the sleeve and its springs and its tread bar being such as to hold the gate barriers down until the last car of the train has passed by, and then raise the barriers. The construction is such that with two trains passing a crossing at the same time, or with a train backing down on a crossing after it has passed, the signal and the gate operating devices will in each case work automatically.

American Institute Exhibition.

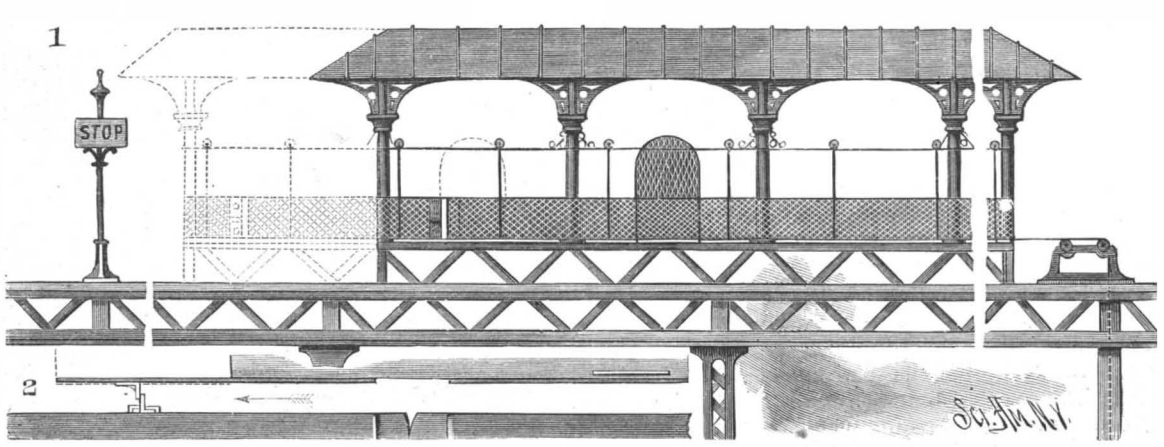
The fifty-sixth annual exhibition of the American Institute will be opened this year on the 28th of September. The buildings are being put in order, and will be painted inside and outside. The feature of the year will be the electrical department, which will occupy fully one half of the enormous buildings. It will be not alone an exhibition of all the latest inventions in this most interesting of mod rn sciences, but as well historical, for in it will be displayed all the noted apparatus of the past. Everything electrical can there be seen, from a motor for drawing trains of cars to the smallest toy. The display of improved methods of lighting and new motors will be the largest ever seen in this country. In addition to this novel exhibition, there will be an exhibition of other late inventions in the mechanical arts, so far as it is within reach of the management to find the required space for their accommodation. Intending exhibitors who have not yet applied for space should not longer delay their application.

AN IMPROVED DUMPING CAR.

For cars such as are usually employed in transporting coal, the invention herewith illustrated, which has been patented by Mr. William L. Davis, of South Amboy, N. J., affords an improved construction and mechanism for operating the doors, whereby they can be easily opened to any desired extent, and will be held in such adjustment, or can be quickly and securely closed to cut off the discharge, while the operating mechanism is wholly on the exterior of the load bin. The discharge opening is regulated by weighted doors, which slide on the under side of the inclined walls of the chute, in converging guides, chains attached to the lower edge of each sliding door at either end being connected to transverse shafts journaled in bearings in the bottom beams. The ends of these shafts are also journaled in bearings in the outer beam, and chains are wrapped around the shafts between the inner and outer beam, in opposite directions, and connected to a short shaft which carries a hand wheel, by turning which the doors will be raised. A ratchet wheel on the latter shaft is engaged by a dog pivoted to the car body to hold the doors open, and on releasing the dog the doors descend by gravity to close the discharge opening.

AN IMPROVED ELEVATED RAILWAY GATE.

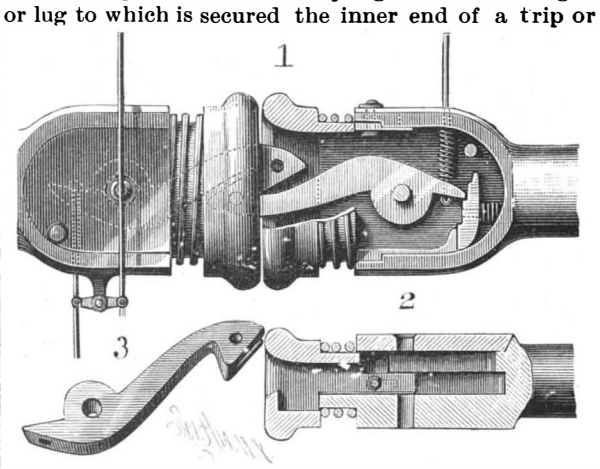
A device for controlling the admission of passengers from elevated railway stations to the cars, and preventing any from being forced from the platform on to the tracks, has been patented by Mr. Leonida Rinaldi, of No. 219 East Thirteenth Street, New York City, and is shown in the accompanying illustration. Upon the edge of the platform, next the tracks, and extending its full length, is a railing supported by lower and by upper rollers, the latter riding upon a rail carried by the posts that support the roof. Near the forward end of the railing is a projection extending into the path of a swinging projection carried by one of the forward cars or by the engine of a train, while to the rear end of the railing is connected a weight, by means of a chain or wire, extending over spring-supported sheaves, the weight being housed within a tube or box, in the lower portion of which is a buffer spring. As a train nears the forward end of the station, the projection from the locomotive or a forward car strikes the projection from the railing, so that the railing is carried along to open one or more gates, one such opening being indicated in dotted lines in Fig. 1, at the same time raising the suspended weight. After the passengers have boarded the train, the projection swinging from its forward portion is withdrawn, by a manipulating cord, from engagement with the projection attached to the railing, when the weight acts to return the gates to closed position, this cord also serving to enable the engineer or trainmen to pass a station without opening the gates when it is desired to go by without stopping.



RINALDI'S GATE FOR ELEVATED RAILWAY STATIONS.

AN IMPROVED CAR COUPLING.

A car coupler by which cars will be automatically coupled on coming together, and in which the buffer springs will hold the buffers close together, so that no space remains between them wherein the foot of a person may be caught, is shown in the accompanying illustration, and has been patented by Mr. Nelson Muslar, of West Boylston, Mass. The buffer of each drawhead has rearwardly extending guide arms, working in a groove, and a buffer spring surrounding the buffer behind its head abuts the forward end of the drawhead, in which the buffer is yieldingly held, an extension of the drawhead projecting into the buffer and limiting its inward movement, as shown in Fig. 2. Behind its pivot point the coupling hook has a tongue or lug to which is secured the inner end of a trip or

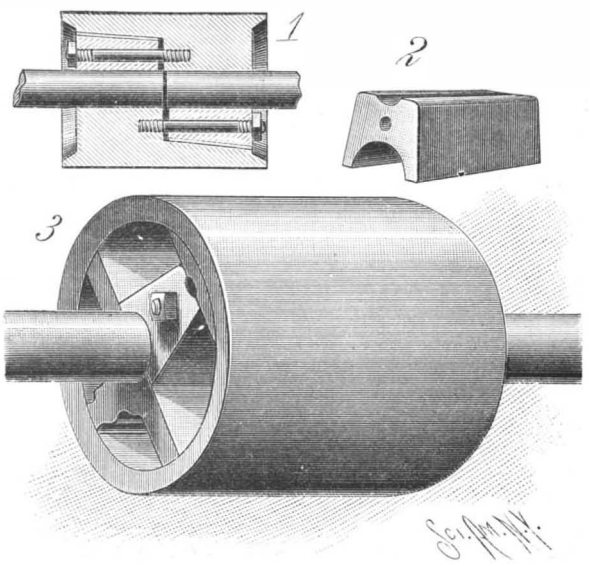


MUSLAR'S CAR COUPLING.

operating rod, the other end extending outward to a point where it may be conveniently reached by the train hands. Surrounding this rod, within the drawhead, is a spiral spring that holds the coupling hook in locked position until uncoupled by the operating rod, which also has connections whereby it may be operated from either side of the car. In a recess in the rear of the coupling hook is a catch block loosely held on a stem surrounded by a spring, whereby the catch block is pressed outward against the lug on the rear of the coupling hook, thus swinging the coupling hooks to automatically couple cars coming together. Each coupling hook is formed with a lateral recess in its outer end, with a hole at right angles thereto, so that a car provided with this improved coupler may also be coupled to a car having the ordinary link and pin coupler.

AN IMPROVED SHAFT COUPLING.

A strong and simple form of shaft coupling, in which the body of the coupling is preferably made to be used as a pulley if desired, is shown in the accompanying illustration, and has been patented by Mr. Robert J. Stuart, of New Hamburg, Dutchess County, N. Y. Fig. 3 is a perspective view of the coupling applied,



STUART'S SHAFT COUPLING.

Fig. 1 being a sectional elevation and Fig. 2 showing one of the wedges for securing the coupling and shaft together. The interior of the body of the coupling is formed with two opposite bridges, each of which joins the body by three webs, each bridge having a concaved seat for one end of a shaft, and the seats being at opposite ends and opposite sides of the body, so that the coupling is perfectly balanced as to weight. Opposite each bridge is formed an inclined surface, against which the outer inclined surface of a wedge acts for binding the shaft and the coupling together, a bolt passing through the wedge, and screwed into one web of the bridge, forcing the wedge into the coupling for binding the shaft.

TO MAKE GRAVEL ROOFS.—First tack two-ply tarred paper on your roof, then boil tar and pitch together and apply with brush hot, then scatter pebbles over tar and pitch when soft.

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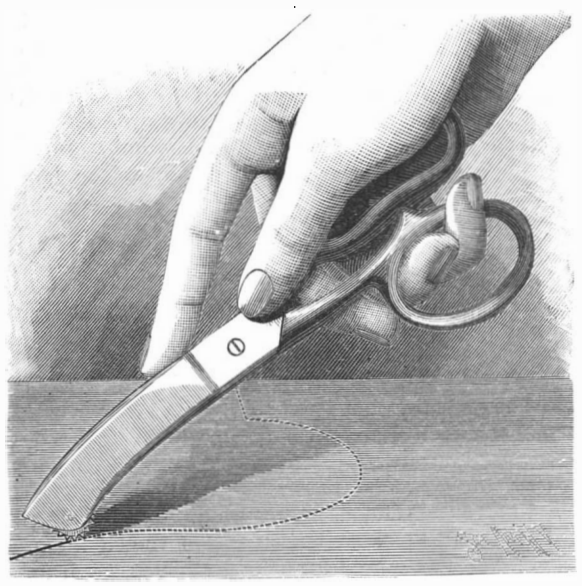
A PATTERN TRACING AND CUTTING DEVICE.

A simple modification of the ordinary scissors or shears, and one that cannot fail to be extremely useful for dressmakers and others cutting to pattern, is shown in the accompanying illustration, and has been patented by Mr. Frank E. Buddington, of No. 2108 Wabash Avenue, Chicago, Ill. Heretofore it has been customary to first use a tracing wheel to run over the

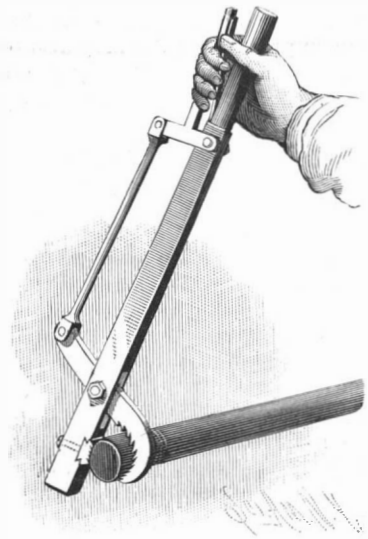


BUDDINGTON'S TRACER AND SCISSORS.

lines on the paper or other pattern sheet, thus transferring the pattern, but this required two independent tools, which was sometimes an inconvenience. By this invention the tracing wheel is made a part of the scissors or shears used to cut out the material, the wheel being mounted on the forward portion of the back of one blade. After thus marking out the pattern, as shown in the illustration, the scissors are inverted and used in the ordinary way for cutting the fabric as marked.

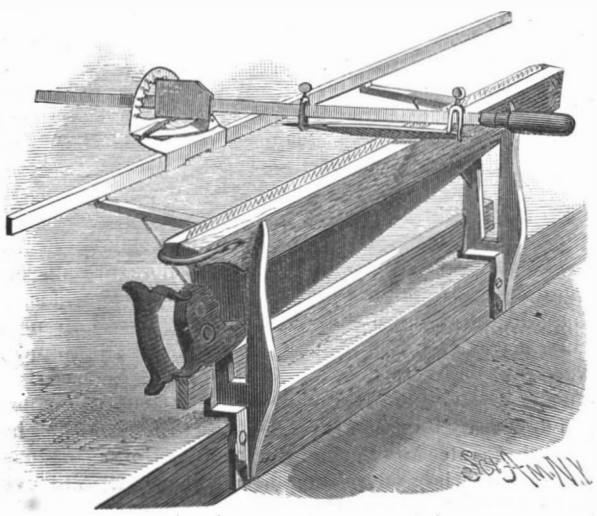
AN IMPROVED PIPE TONGS OR WRENCH.

A wrench which is readily adjustable to different sizes of pipe, and whose jaws give a great amount of bearing surface, is shown in the accompanying illustration. At the end of the shank opposite the handle end is a dovetailed slot, adapted to receive a detachable jaw with concave toothed surface, this jaw being held in position by means of a screw passing through the shank and engaging its under side. Near this stationary detachable jaw is pivoted a movable jaw, the end of which, projecting through the shank, is connected by a rod with a lever pivoted by arms to the shank near its handle. This handle lever is normally held open by a spring, thus holding the jaws of the tongs open, but in applying the wrench to a pipe this lever is pressed down upon the handle by the hand, tightening the toothed jaws upon the pipe in proportion to the force applied.



CARVIN'S PIPE WRENCH.

For further information relative to this invention address the patentee, Mr. Edward O. Carvin, Berryvale, Siskiyou County, Cal.



SHERMAN'S SAW FILER.

Annual Report of the Commissioner of Patents.

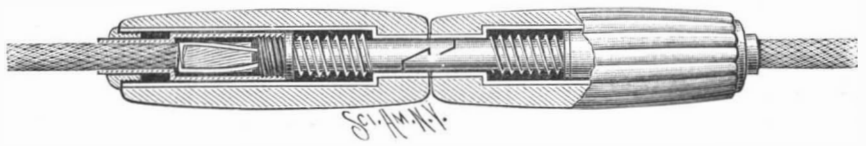
Hon. Benton J. Hall, the Commissioner of Patents, in his synopsis of his annual report furnished the Secretary of the Interior, says that the number of applications for patents of all kinds received during the fiscal year ending June 30, 1887, was 40,678. The number of patents granted during the year, including reissues and designs, was 21,732; number of trade marks registered, 1,101; number of labels registered, 584; number of patents expired, 12,782. The receipts of the office from all sources aggregate $1,150,046; total expenditures, $971,644. For 1886 the number of applications received was 38,408.

The Commissioner renews the recommendation of his predecessors that the Patent Office be furnished with more room.

Referring to the defalcation of Financial Clerk Levi Bacon, deceased, the Commissioner says that the shortage was $31,091, against which were found due bills, miscellaneous memoranda, etc., amounting to $15,011, leaving net cash unaccounted for, $16,080. Of this latter sum $11,525 is public money, belonging to the revenue of the office. The remainder, $4,555, belongs to the attorneys' fund. From the aggregate of the due bills $8,668 have been collected, leaving $22,422 as the present deficiency.

AN IMPROVED BELL CORD COUPLING.

An easily adjustable bell cord coupling, for use on railroad cars, and one which will not part or become disengaged after coupling, is shown in the accompanying illustration, and has been patented by Mr. Christian H. Peters, of No. 508 East North Street, Danville, Ill. It consists of a metal tube or casing within which the coupling hooks on the meeting ends of the bell cord work, the tube being covered by a snugly fitting jacket of soft rubber, to prevent the breaking of glass, etc., when the cord is violently pulled through the cord hangers. The coupling hooks are threaded at their inner ends, and have projecting fingers which bite into the ends of the bell cord, a sleeve, passing over the end of the cord and fingers, screwing on the threaded end of the coupling hook. A spiral spring working within the casing acts to hold the coupling hook in place when the connection is broken, and also serves to tighten the coupling joint and prevent the hook from becoming disengaged.



PETERS' BELL CORD COUPLING.

AN IMPROVED SAW FILING MACHINE.

An efficient and easily worked device by which saw teeth may be filed to an accurate and uniform bevel and pitch is shown in the accompanying illustration, and has been patented by Mr. Hamilton Sherman, of Waverly, Pa. It consists of a file frame guide with a base plate sliding on a guide bar. A head piece is pivoted to the base plate, so as to be movable in horizontal plane, and has a guide frame for the file-holding frame bar to slide through, pivoted to the head piece, to swing to either side of a vertical line, there being catches for holding the file to the required sidewise, slanting, and axial positions. The saw is firmly held in the clamp of the machine frame, which is so made as to be easily taken apart and put together, and the file frame, in which the file has been set, is adjusted at the required angle to give the proper bevel to the saw teeth, and also to set the file axially, and the file is then held relatively in these same positions to the saw throughout the work of filing. Accuracy and uniformity are thus secured, and the operation can be most expeditiously performed.

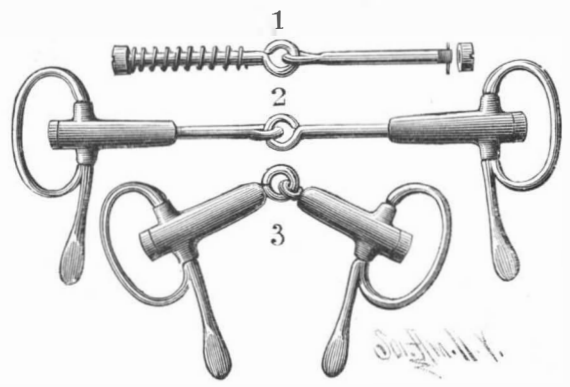
IMPROVED ATTACHMENT FOR BLINDING HORSES.

A device that is readily applicable to any bridle, and by which a horse may be quickly and effectually prevented from seeing, the device being operated from either the saddle or a vehicle, is shown in the accompanying illustration. The invention consists in providing the blinds or winkers with small pulleys, in connection with straps or cording passing through the pulleys, the straps or cords being united over the neck and operated with the reins. The device is extremely simple and inexpensive, but enables the driver, with a sharp pull of the cord, to instantly cover the horse's eyes, and thus effectually blind him. The horse thus suddenly blinded generally becomes docile, and can be led at will, many horses having been saved from fire, as is well known, by throwing a blanket over their heads, without which it is frequently impossible to lead them from their stalls in case of fire in stables. As there are about 12,000,000 horses in the United States, it is evident that there is a large field in which such an invention is applicable, as for carriage, buggy, and saddle horses, and with all animals generally kept for private or family use, as a precaution against accidents.

For further particulars address the patentee, Mr. Charles H. Adams, 52 Broadway, New York City, room No. 79.

AN IMPROVED BIT FOR HORSES.

A bridle bit which can be instantly converted from a bit for gentle or easy driving to a severe bit for curbing frightened or vicious horses is shown in the accompanying illustration, and has been patented by Mr. James A. Manning, of Danville, Ind. The mouth bars of the bit may be made either round or square, or with concaved sides, being jointed in the middle as in the ordinary snaffle bit, and surrounding each bar, within sleeves, is a spiral spring. Fig. 1 shows the bit having the spiral spring on one mouth bar, but without the sleeve, Fig. 3 showing its normal shape during easy driving, and Fig. 2 as the sleeves are drawn outward by the excessive pulling of the horse upon the reins. The great leverage afforded by the bit in the latter position, especially when the mouth bars are of angular form, is calculated to quickly reduce the horse to submission, whereupon, with lessening tension upon the reins, the sleeves are returned inwardly over the mouth bars by the springs. The sleeves are secured to or formed integral with the usual rein rings and bars or guards.

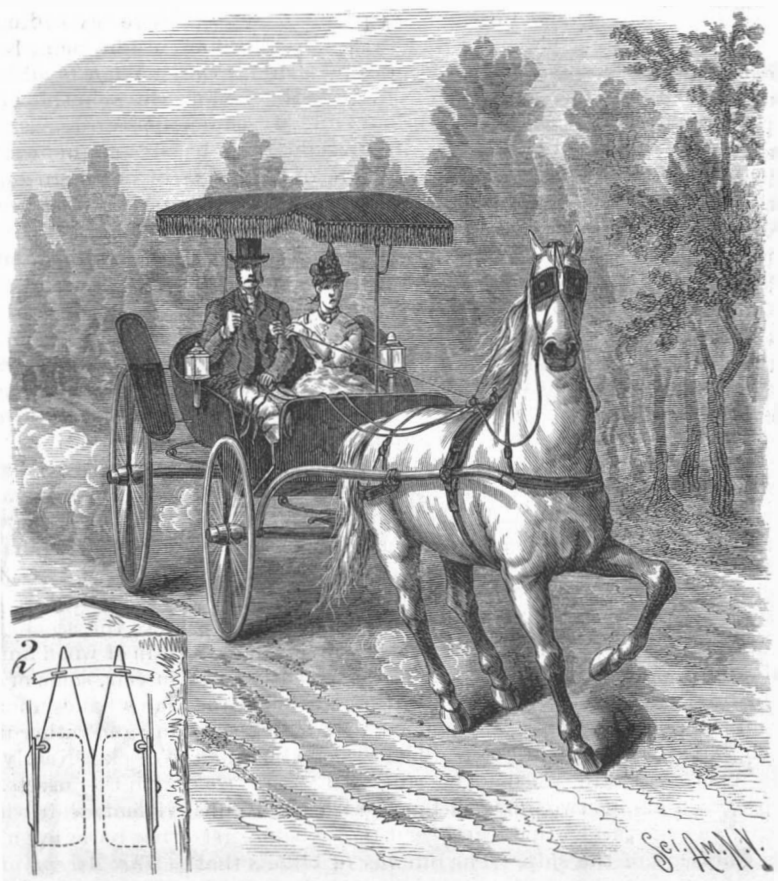


MANNING'S BRIDLE BIT.

Moisture-proof Glue.

Dissolve 16 ounces of glue in 3 pints of skim milk, and if a still stronger glue be wanted, add powdered lime.

For marine glue, heat moderately a mixture of India rubber (one part by weight), mineral naphtha or tar (two parts), and add twenty parts of lac in powder. To use this glue, it must be heated to a temperature of 120° C.—*Revue Industrielle.*



ADAMS' BLINDER ATTACHMENT FOR BRIDLES.

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OUR NEW NAVY—THE CRUISER CHICAGO.

The contest between defensive naval armor and artillery, which has been going on so persistently since the Monitor and Merrimac fought their famous duel at Hampton Roads, has at last reached a point where naval construction at least seems to pause to take breath. Such ponderous armor-clad monsters as the Thunderer, Devastation, Benbow, Inflexible, and others of equally terrifying nomenclature have been defiantly launched from Britain's shores to awe the world, while our French and German cousins keep their standing armies at an apoplectic fullness and tension of nerves, while their gun foundries are ablaze night and day turning out modern ordnance which (on paper at least) heads the race until some newer and tougher-skinned leviathan is launched and restores the balance for a while. The French have always been good modelers of marine architecture, and their productions were ever of that swift, graceful type that excited the admiration and envy of their covetous British neighbors; but unfortunately for themselves, they did not maneuver or fight their ships with the skill they merited, and from as far back as history relates we find that whenever the Gaul turned out a particularly good craft, the Briton lost little time in trying either to fight her off the seas or capture or sail her himself; and in our own war of independence, our fastest and best ships were modeled after the French. Our Constitution and her sister vessels often found themselves in combat with vessels of like construction that had been captured from France by the British. The Constitution captured the Guerriere, a French ship manned by Britons, and the Bon Homme Richard, a superannuated old French frigate, commanded by Paul Jones, captured the English-manned French ship Serapis. And the process still continues in a modified form. It is not done by capture, of course, but the French type can be distinctly traced in almost all the modern ships, be they Russian, Prussian, or British or American. Since our civil war we have been quietly watching the improvements going on across the water, and when we decided to build a new navy, did we lay the keels of Benbows, Inflexibles, or Thunderers, at millions of dollars each? Not at all. We built as near the French types as we could, and from the looks of the ships they might as well have been planned by French naval architects. They certainly do not resemble the English men of war, as our public would have noted if their war ships were not so shy of our eastern ports, especially New York.

But the public has received the impression that our new crusiers are armor-clad, or at least shot-proof. This is not so. Of the four vessels, Dolphin, Atlanta, Boston, Chicago, so far finished, not one has a thickness of side to prevent the entrance of a good-sized rifle bullet, and an able-bodied man with a sledge hammer and ten minutes' time could make a way in for himself. During a conversation with one of their gunners, he said: "The thinner they can make these ships and float them, the better. There's no ship in existence whose sides will keep out the best modern rifle shot, and if they pile on the iron till they do, the concussion will shake the ship to pieces, or derange its machinery."

Another, when spoken to on the subject, said he would rather "fight on the open deck, where the shot could do its work cleanly, than inside a half-protected inclosure where every shot multiplied itself a hundredfold in the shape of fragments and splinters. Better kill one or two outright than have fifty mangled for life." And the man was right, for it seems as if modern war ships, like modern armies, must leave off armor and strip for the fight. We hear of an ironclad that is to be belted with twenty-one inches of steel fore and aft. It sounds ponderous and safe, but what safety would there be behind it when struck by a bolt from one of the forty-three foot 115 ton Armstrong guns, weighing 1,800 lb., flying at the rate of 2,148 feet per second, or receiving a blow which did not even penetrate, but with an estimated smashing force, such as the new breech loaders exert, of a column such as the obelisk now in Central Park would have if lifted to the height of Trinity Church spire and dropped to the pavement?

But what would our sailor think of the armor belts, if he knew of a gun now being constructed by the Krupp works, at Essen, Germany, weighing 330,000 lb., its shot standing six feet high, weighing 1½ tons, capable of piercing a solid iron wall 4 feet thick? In fact, this monster could load up and fire as shells, the famous guns that Nelson used on the Victory. On the other hand, the Victory, with her regiment of a crew, armed with the modern quick-firing 3 lb. breech-loading rifles, would reduce to a pepper box any available war ship our navy has at present that would lie beside her in action for five minutes. A trial was recently held abroad, in which a steel torpedo boat under full steam, running about 15 knots, was started past a war ship going in an opposite direction. The torpedo boat had no one on board, as may be supposed. Fire was opened on her at two miles distance, with small guns only, and she turned turtle and went under before getting abreast of the ship. The number of bullets that struck her was a handsome percentage of those fired, and the photos. taken of her after she was fished up showed the true pepper box pattern.

It would seem then that the modern gun had the best of it, and perhaps the best thing for us to do in the way of naval *defense* is to build a dozen or two of the familiar, flat, homely American monitors, and add extra thicknesses of metal to their turrets as the big guns grow bigger and keep our modern cruisers out of their range altogether. We give some exterior views of the Chicago as she now lies at the Brooklyn Navy Yard. She is the latest and largest completed of our new cruisers. She is a stately, handsome, and swift vessel of the thin-sided kind. Her decks are broad and open, with appointments of the best material and construction, and is altogether as fine a representative of this sort of vessel afloat. In the same basin beside her lies the old double-turreted monitor Miantonomah, her opposite in almost every respect.

The following are the chief dimensions of U. S. twin-screw steam cruiser Chicago:

Length between perpendiculars	315 ft.
Length on water line	325 ft.
Length over all	334 ft. 4 in.
Depth—garboard strake to under side of spar deck.	34 ft. 9 in.
Height of gnn deck portsill from load water line	10 ft.
Height of spar deck port sill from load water line	18 ft. 6 in.
Breadth, extreme	48 ft. 2½ in.
Draught of water at load line, mean	19 ft.
Displacement	4,500 tons.
Complement of men	300
Battery—Four 8 inch long breech-loaders in half turrets, eight 6 inch and two 5 inch on gun deck.	
Indicated horse power	5,000
Sea speed	14 knots.
Capacity of coal bunkers	940 tons.

Natural History Notes.

How Monkeys Eat Oysters.—A writer in *Nature* gives the following description of the monkey's method of taking and eating oysters:

In the islands of Meigue archipelago, the rocks left bare at low tide are covered with oysters of different sizes. A monkey, probably the *Macacus cynomolgus*, which inhabits these quarters, prowls along shore when the sea is low, and opens the oysters attached to the rocks by striking the upper shell with a stone until he has broken it. Then he extracts the mollusk with his fingers or swallows it directly from the shell. Upon frightening these epicures away, the observer found that the stones that they left behind had been selected with a view to being easily grasped by the animal's fingers, and not with regard to heaviness. The fact is the more curious in that the rocks to which the oysters are attached emerge from mud, and the monkeys are obliged to procure the stones on the shore at some distance off. Instinct singularly guides them in the operation, for they begin by breaking the hinge, and then the shell above its point of attachment. The gibbons that inhabit these islands do not eat oysters.

How Spiders Moult.—When a spider is preparing to moult, it stops eating for several days and fastens itself by a short line of web to one of the main lines of its snare, which holds it firmly while it proceeds to undress. The skin cracks all around the thorax, and is held only by the front edges. Next the abdomen is uncovered. Now comes the struggle to free the legs. It works and kicks vigorously and seems to have very hard work, but continued perseverance for about fifteen minutes brings it out of the old dress, and it seems almost lifeless and is limp and helpless for several minutes, but gradually comes back to life and looks brighter and prettier than before.—*Swiss Cross.*

Vitality of Seeds.—The experiments of Count De Buysson show that it is an advantage to soak seeds of doubtful germinating power for thirty-six hours in some liquid containing nitrogen (for example, 15 grains of guano to a quart of water), since the germinating power of a seed is proportionate to the amount of nitrogen it received during its formation, and which it has retained during its period of dormant activity. If it be desired to preserve the vitality of seeds for any length of time, it is necessary to prevent heat and moisture from affecting them, since these are the agents that facilitate germination.

The variation in the period that may elapse between the planting and germination of seeds, of which the henbane is a well-known instance, has lately been shown to exist also in the case of the Brazil nut. From experiments made at Kew, it appears that while some of the seeds sown germinated in a few weeks, others did not germinate for two years.

A Rain of Ants.—La Nature states that at five o'clock in the afternoon, on July 21, the city of Nantes was the scene of a curious phenomenon. A genuine rain of wood ants fell in the streets and squares. These insects, some of them winged and others not, fell like snow flakes upon the heads of pedestrians. This living and rather unusual kind of shower lasted till six o'clock. Nearly every quarter of the city was strewed with the insects. The phenomenon was attributed to violent whirlwinds, the precursors of a heavy storm that burst upon the city on the following night.

The Ascent of Sap.—In a paper lately read before the Royal Botanical Society of Edinburgh by Mr. G. F. Scott Elliott, on "The Ascent of Crude Sap," the author asserts that crude sap travels in the lumen or cavity of cells, and not within the walls of the vessels and tracheids, as Sachs supposed. Transpiration ceases if the lumina are closed by injection or by strong compression of the stem, although continued when the cell walls are changed to gum. He regards Dufour's experiments with bent twigs as quite fallacious. If air be present in the vessels, it can only be the case during the day at the time of the greatest loss of water, since the vessels form a close system, and wet cell walls are impervious to air. He considers it physically impossible that air bubbles can give any active assistance in the process. It is impossible at present to calculate the separate effects of capillarity, root pressure, osmosis, and transpiration in causing the ascent of crude sap.

Malformation of Fish Fry.—Mr. Seth Green contributes an article to the *American Agriculturist* in which he describes the various sorts of malformation observed in newly hatched fish. He says that the "two kinds of malformations most frequent among the young fry are those with two heads and one body or trunk and those known as Siamese twins, from the fact of their being connected similarly to that celebrated monstrosity. Rare cases occur where the fish have three heads on one body. Among the millions of young fry that have passed under my observation, I have seen but two specimens of this kind. The fry are also subject to all sorts of curvatures of the back bones. The curves are found at nearly all degrees, from a slight bend to a complete circle—the head and tail meeting. Some which are affected in this way are able to swim, but they go round and round in a continuous circle. Others are so knotted as to be unable to make any progress whatever. The cause of death to these peculiarities is the absorption of the yolk sac which is attached to each young fry. While this remains, food is unnecessary, and it will sustain life in the deformed fry for about thirty days and in a healthy fish for about forty days. When it is gone, the former die of starvation, as they are unable to find food. For the sake of the experiment I have tried to prolong their lives by careful feeding, and have succeeded in so doing for about sixty days, after which they succumb. One peculiarity is that the malformed fry have a tendency toward a superabundance of heads rather than tails. I have never found a specimen with more than its share of caudal appendage.

"Albinism is not unfrequent. The fish are perfect albinoes in every respect, even to the pink eyes. These we have raised, and they are really beautiful little creatures, and when placed in a glass jar every bone and fiber in their nearly transparent bodies, fins, and tails can be plainly discerned."

Plumbing Leakages.

Mr. Wm. P. Gebhard, an excellent authority on the subject of testing leakages in pipes, while preferring the water test for new buildings, considers the peppermint the best suited for old buildings. It is an extremely pungent essence, and being readily introduced into the pipes in a house, even by those who are neither plumbers nor sanitary inspectors, the slightest leak will be readily detected. It is well, however, that the party about to use it should, if not a plumber, know how it should be applied. The best place to do this is outside on the top of the roof, because if the odor should be released in a room or around a fixture, even for an instant, it would be impossible to detect a leak afterward. Whoever applies the peppermint should remain on the roof until the experiment is made, as he would otherwise carry the odor on his clothes into the house, and thus defeat the object of the test. Now, as to the best means for using the peppermint. Some pour an ounce or two of pure peppermint oil into a pail of very hot water, and pour it into the soil pipe, while others pour in the oil and follow it with hot water, taking care while the search is conducted below to cover the top of the soil pipe above the roof. There is thus no chance of escape, unless through leaks in the pipe, and a careful examination of every line of pipe, and around each fixture, will readily enable the investigator to determine, where, if any, there is a leak. Care should also be taken that while the examination is being made none of the fixtures shall be discharged, as otherwise the air in the pipes laden with the peppermint odor might find its way into the rooms.—*New England Stove Journal.*

Poisonous Fishes.

In the exhibition at Havre there is, says *Nature*, an interesting collection of specimens of poisonous fishes. Some are poisonous when eaten; others are merely venomous. Among the first are many sparoids, a tetrodon, and many *Clupea*, which are abundant near the Cape of Good Hope. In the Japan Sea is found a very peculiar tetrodon, which is sometimes used as a means of suicide. It brings on sensations like those produced by morphia, and then death. Another interesting collection in the exhibition is that of a number of bacteria and pathogenetic microbes. This collection was formed by Prof. Cornil, of Paris.

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Correspondence.

Honey in Tasmania.

To the Editor of the Scientific American:

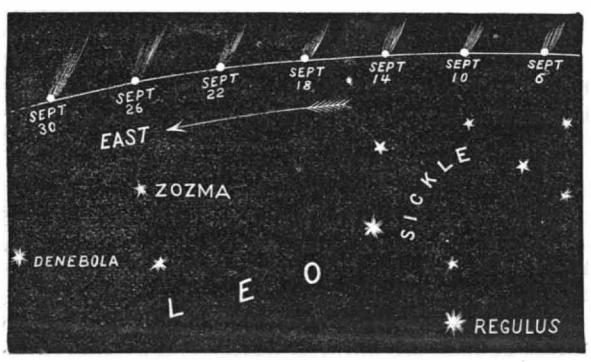
I beg to call your attention to the article which appeared in the SCIENTIFIC AMERICAN of May 28, 1887, copied from the New York *Medical Journal.* There is something wrong somewhere. Evidently a mistake has been made in the locality. The author has been, to use a vulgar phrase, "barking up the wrong tree." It is certainly true we have the eucalyptus tree to any extent, but his imagination has assisted his memory as to the size of the trees. As to honey, we have it, but in very limited quantities; in fact, there is very little exported, if any. Of late the Ligurian bees have been introduced here, but I do not think they have been very successful. E. HAWSON, Secretary.

Chamber of Commerce, Hobart, Tasmania,
July 9, 1887.

THE OLBERS-BROOKS COMET.

To the Editor of the Scientific American:

The comet it was my privilege to discover on the morning of August 25, 1887, in the eastern heavens, proves to be a very interesting one, viz., the return of the Olbers comet of 1815. It is its first return since 1815, thus establishing its periodic character, with a revolution about the sun in a period of about seventy-two years. It is therefore a member of our own solar system. It now takes its place as the third in the known list of comets of long period, established by an observed return to perihelion. The first of these is Halley's, with a period of seventy-six years; the second the 1812 or Pons-Brooks comet, rediscovered by the writer on September 1, 1883, and having a period of 71 years 4 months and 10 days.



THE OLBERS-BROOKS COMET, 1815 AND 1887.

I present herewith a chart showing the positions of the Olbers-Brooks comet during the month of September, and from which its course through the heavens may be traced still farther.

It makes its perihelion passage, or nearest point to the sun, about October 6, 1887. The comet is slowly increasing in brilliancy, and may be readily observed with telescopes of moderate aperture. It has a star-like nucleus and a short tail.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., Sept. 5, 1887.

Solid Truth.

Every thinker knows that the man who would succeed must do more work than he gets paid for, in every profession and trade. We take it for granted that the man who will do only $20 worth of work a week because his salary is but $20 will never get more than $20 a week, for the simple reason that he has never shown his employer that he is worth more. We figure it that an employe who means to succeed has to do from 10 to 20 per cent more work than he gets actual pay for. This he has to do until he reaches a certain point, and, having reached that point, he will find that by so much as his income has increased, by so much has the demand for amount and intensity of his labor diminished. To put this theory into figures, we will say that a man receiving $20 a week should do $30 worth of work; a man receiving $30 should do $40 worth of work; and so on until say the salary reaches $75, and then the laborer can give himself somewhat a rest, that is to say, about $50 worth of work will satisfy his employer. Labor brings its market value, and is seldom overpaid, oftener underpaid. It is the experience, the "know how," that brings the money.—*Industrial Gazette.*

Safety in Mines.

Mr. Ellis Lever has decided to renew his offer of £2,500 for a perfectly safe, practical, and efficient means of blasting without gunpowder. He has communicated his intention to the British home secretary, and, on the condition that the government will undertake the necessary tests and make the awards, he has offered to place in Mr. Matthews' hands $5,000, to be awarded in two premiums of $2,500 each—one for the best method of safe blasting in coal mines without the use of gunpowder and the other for a perfectly safe system of electric lighting in mines, to supersede the present so-called safety lamps.

Auto-Stereotypic Printing.

BY HERMAN REINBOLD.

A new process of auto-stereotypic printing, especially adapted for the reproduction of books and engravings, has lately been invented in Switzerland, and is already used with advantage at the establishment of Orell, Fussli & Co., at Zurich, a printing office of European fame.

The process will cheapen the reprinting of the works of foreign authors, which is done considerably here in this country. By this method the type setting and copying of engravings is saved, and an accurate stereotyped plate is obtained directly from the original. It is a transfer process, and for the reproduction two newly printed copies of the publication to be reproduced are necessary to insure complete success.

It is done in the following manner:

Plaster of Paris, best quality, is mixed with water to make it a thin putty without lumps, and to this a little alum or salt is added to make it set quickly. To every five pounds of the plaster are then added:

Silicate of potash or silicate of soda	3 oz.
Phosphate of lime	2 "

The mixture thus obtained is then put upon a perfectly level piece of plate glass of the desired size, around which iron rods are placed, and left to get hard. The plaster cast ought to be at least type high, to prevent breakage. While the mass is setting, the back ought to be scraped level, and should remain undisturbed until it is perfectly dry and hard. After that it may be taken off, and it will be found to be as smooth as the glass itself.

The paper to be reproduced is next placed, with the side to be copied down, in a dish which contains the following transferring solution:

Distilled water	16 oz.
Alcohol, 90°	5 "
Acetic acid	¼ "
Phosphate of soda	¼ "

Care should be taken not to get the solution on the back of the paper, which is not to be transferred, as it is then liable to print through when it is drawn through the transferring press. Should the print to be copied have been printed for some time, it is desirable to warm the solution and float the paper longer on it. The sheets should be left on the solution for at least two hours to insure perfect action.

In the mean time, the plaster of Paris plate, which was completely dried before, is prepared in a dark room.

A solution of five ounces of gelatine in twelve ounces of water is prepared by letting the former soak for half an hour and then heating it to about 190°. Care must be taken to prevent the boiling of the solution. To this six drachms of citrate of iron and ammonia and two ounces of alcohol are added and well filtered. This is when still warm. Put into a flat dish covered to a depth of about a quarter of an inch. It is well to put this dish upon a hot metal plate, as it gets hard quickly when getting cold. The plaster of Paris plate, which itself is warmed first, is dipped in the solution on the smooth side for a moment, thus letting it take up some of it, whereupon it is taken out and dried in the dark. When dry, the copy is transferred upon it in the usual way, the plaster having been placed between rubber sheets to prevent it from breaking. Of course, also, this has to be done in the dark room, that is, at lamp or gas light. The plate is then dried once more and exposed to direct sunlight for fifteen minutes. When taken out, the places where the light has acted will be found to be quite hard, while at the other places the plaster is soft and will fall off as fine powder as deep as the solution has penetrated, if brushed with a hard brush. After that the plate is ready to be stereotyped.

Curious Effects of Lightning.

The steamship Anchoria of the Anchor line, which lately arrived in New York, met a tornado 180 miles from Sandy Hook. The wind came on from the northeast, and in a very short time there was a tremendous sea running. The rain came down in such floods that the crew were scarcely able to stand upon deck. The lightning poured in streams of a minute's duration from the clouds to the water, while globes of blue flame played up and down the rigging and danced along the yards, and leaped from the masts incessantly, terrifying passengers and seamen alike. For about two hours the wind blew at eighty miles an hour. Neither lookout nor pilot could see beyond the ship's rail, because of the solid sheets of rain and flying clouds of spray in which the ship seemed to be walled up as by a fog. The engines were run dead slow, and the ship lay to head to the gale. At the end of two hours the gale broke, and pleasant weather soon followed. No damage was done by either wind or electricity.

The steamship Glenartney, from Shanghai, was in the same storm, and had well-defined tufts of electric fire on each masthead.

Lightning struck Charles M. Lee, a cowboy, and also his horse, and killed them both, near Cheyenne Wells, Col., the other day. The stroke broke the iron horn of the saddle, exploded all the cartridges in his belt, and set fire to the leather of the saddle, picket rope, blankets, tearing his hat, boots, and shirt to pieces, and the fire consumed the flesh of the left leg from the knee to the ankle.

In Cape Colony, South Africa, a shepherd drove a flock of 1,430 ewes up to a small building, in which he took refuge from a thunderstorm. As the sheep crowded around the building it was struck by lightning, and 790 of them were killed outright. The shepherd escaped with a severe shock.

The Folly of Decrying Patents.

The *Railway Master Mechanic*, a newspaper published at Chicago in the interests of railway motive power, equipment, and machinery, says in respect to patents:

We constantly hear men exclaim about the "uselessness" of patents, that such and such a person "is fooling around with pat nts," that "he will never get anything out of it," etc. Well, suppose he does not; do we not all of us run our chances of not "getting anything" out of our regular business transactions? If a man buys a barrel of beef, he may lose on it. What is the difference between the grocer and the patentee? Both are risking time and money for a possible gain. All the profits of all the grocers in the country do not exceed the profits derived from patents. It seems a little like sour grapes to decry patents. If one cannot invent, it is not necessary for him to decry those who can, in order to display his ignorance. We have our unsuccessful business men, lawyers, doctors, scholars, and even railroad men. Why not, therefore, our unsuccessful inventors? In most other kinds of business, men drop out as soon as they are disappointed, and live out of sight; but the inventor has more pluck, and generally goes on and keeps in view. Thus is derived the long list of poor and unsuccessful inventors. Let us in the future be more generous, and remember that inventors are our only hope while we desire to keep up this advancing civilization.

Great Losses of Fish.

In the vicinity of Galena, Ill, the fish in many of the streams have lately died by the million, and the few that are left are rapidly following suit. The banks of the Galena River branches are lined with dead fish of all sizes and varieties, from the tiny minnow to the mammoth cat and sturgeon. At Buncombe, Wis., dead fish are so numerous on the banks that the stench arising from them is almost unbearable. At Lancaster, Wis., the scene on the river bank beggars description, over 50 wagon loads of dead fish being in sight. There are numerous theories afloat as to the cause. One is that the recent rains have roiled the water with mud, so that the fish have been unable to breathe, and struggling to the surface for air, have died. Another is that during the dry, hot summer, the valleys and marshes above were filled with some poisonous growth that with the recent floods was carried into the streams and poisoned the water.

English Naval Dangers.

The Crown Princess of Germany has nearly lost her life twice since coming to England, while under the fostering care of the British Navy. Soon after her arrival there, the royal yacht on which she was traveling with her husband, the Crown Prince, came into collision with one of the troop ships, and escaped only by accident, and not by good management, from being sunk. On August 25, the Crown Princess met with another naval accident which frightened her even more than on the occasion of the previous disaster. While on her way back to the Isle of Wight from a visit to the Royal Naval Hospital at Haslar, she was persuaded to embark on board torpedo boat No. 79. It was intended to show the royal party some evolutions. In passing at full speed round the stern of the ironclad the Invincible, which is stationed at Guardship, off Cowes, the helm of the little boat was put hard over to starboard, and then the order was given to put helm midships. It was found, however, that the wheel had got jammed and could not be moved, and before anything could be done, the torpedo boat dashed into the Invincible at full speed, striking her amidships. The collision caused a violent concussion on board the little craft and twisted her stem almost double, also straining the bow considerably. Fortunately, the barge of the royal yacht Victoria and Albert was close by, and the royal party was quickly transferred thereto. The Crown Princess and suite were naturally somewhat alarmed, but fortunately escaped without injury.—*N. Y. World.*

Potato Planter Eloquence.

In a recent infringement trial before Judge Bradley, United States Circuit for New Jersey, the learned magistrate gives the following: "The new machine is better than the old one, no doubt; the spears are differently arranged, so as to secure a potato more certainly every time, and other improvements are adopted; but to say that it is not an improvement on the old machine is to abandon the dictates of common sense for the transcendental distinctions of ingenious theory."

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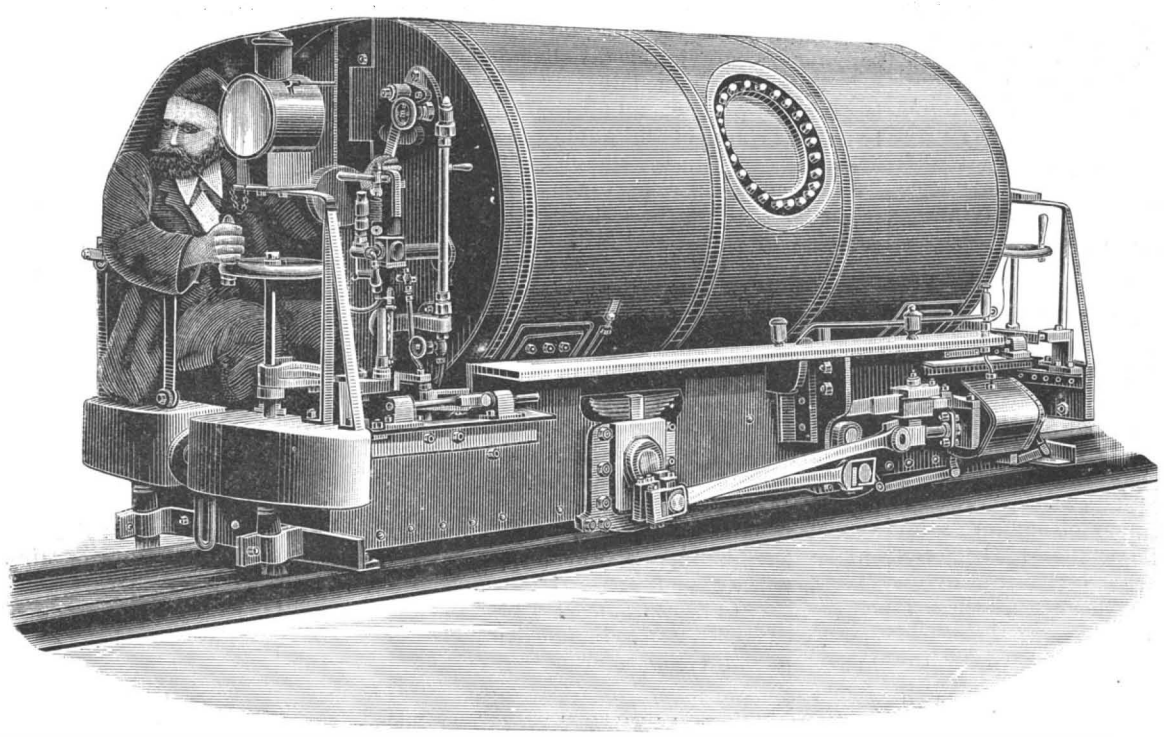
FIRELESS MINING LOCOMOTIVE.

This locomotive was designed by Mr. R. Riedel, and constructed by the Hallesche Maschinen-Fabrik, Halle, for the Wilhelm Adolf lignite mines at Lebendorf, where in a working of very small dimensions it draws twelve coal trucks, weighing 1,500 pounds each, at the rate of about 7 miles an hour. The total height of the engine is only 4 feet 6 inches, the width over all 3 feet 7½ inches, while the length, including a seat for the driver in a somewhat cramped position, is only 11 feet 5¾ inches. The four wheels, 15¾ inches in diameter, are coupled. The wheel gauge is 18½ inches, and the cylinders have 5⅛ inches diameter and 7⅞ in. stroke. The above figures will show how economical the designer was obliged to be when proportioning his locomotive, in consequence of the very limited space at his disposal. The dimensions of the tunnel in which the locomotive works are 4 feet 8¼ inches in height and 4 feet 2¼ inches in width, leaving but about 2 inches between top of engine and roof of tunnel.



FIRELESS MINING LOCOMOTIVE.

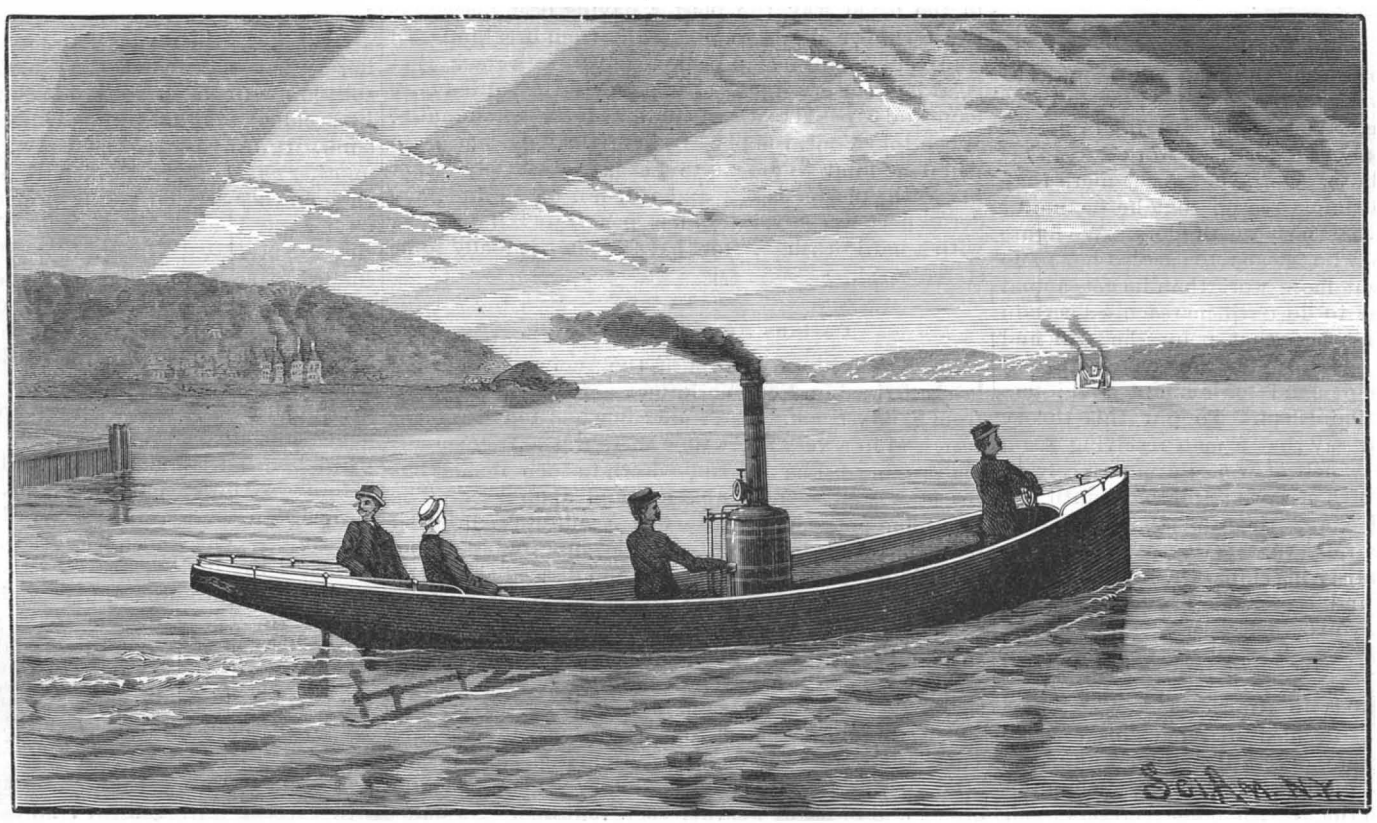
The boiler of the locomotive is constructed on the Honigmann principle, in which the exhaust steam is condensed by a concentrated soda solution, and the heat thus obtained is reused for the evaporation of water. The cycle starts with a high temperature of both water and soda solution, and after the latter has been so far diluted by the condensed water as not to be able to evaporate any more water, the concentration of the lye is effected by steam passed in the water space of the locomotive boiler from a stationary boiler on the works, in which a pressure of 175 pounds is maintained. With this arrangement no other machinery or boilers are necessary in the mine, and the inconvenient operation hitherto required of emptying and refilling the boiler of soda lye has also been abolished.

In the case of this particular mine, a considerable saving has been effected in consequence of the use of steam power in place of manual power, but it would have been impossible by any other method save the Honigmann soda boiler, which emits neither steam nor smoke, and it is to be hoped that this system will be more widely introduced into mines, where its application is particularly desirable.—*Engineering.*

LIGHT DRAUGHT STEAM LAUNCHES.

There has been a great increase in the use of small steam launches within a few years past, with a proportionate demand for such improvements in their construction as will render them easily manageable by and safe with amateurs. For this purpose they have needed to be very strongly built for such light boats, and it was indispensable that their machinery should not be at all complicated. A boat of this description, of great power and capacity for its size, and which has proved a great success during the past year, is shown in the accompanying illustration, and is manufactured by Messrs. H. B. Williams & Co., of Rochester, N. Y. Its distinguishing feature is a patented automatic skag, hinged to the keel near the rear of the boat, in such a way as to allow the propeller shaft and itself to move upward through a well, and bring all the working parts entirely out of danger, when the boat passes over obstructions or through shoal water. In deep water the propeller has its full diameter submerged, but as the boat enters shallow water the skag commences to feel bottom, and gradually works itself upward, the wheel still revolving, thus also passing over snags and other obstructions as long as there is water enough under the keel to float. A boat, 70 ft. long and 15 ft. broad, built on this principle, has done considerable excursion business the past summer on the Genesee River, carrying 350 to 400 passengers at a time, and running over the snags and shoals in the upper portion of that stream without any trouble. The engine of this boat is 8 in. stroke and 7½ in. diameter of cylinder, with direct-acting propeller. The boat draws only 8 inches of water with 250 people on board, and can make ten miles per hour without forcing, the machinery taking up but a small fraction of the room and consuming far less fuel than usual with other styles of boats of similar capacity.

The firm make a variety of styles of boats, all of light draught for their proportionate carrying capacity, of graceful appearance and fine finish, and calculated to attain a higher rate of speed than has heretofore been generally sought in such craft. With this purpose they have given particular attention to their build of engines and boilers, their No. 1 pattern occupying a space of only 16 in. in width by 24 in. in length, and sitting directly on the bottom of the boat. Either hard or soft coal or wood is used for fuel, and the boiler is of steel, without rivets. The firm, besides their marine boilers, also make others for manufacturing purposes, especially in one, two, and six horse powers.



H. B. WILLIAMS & CO.'S LIGHT DRAUGHT STEAM LAUNCH, WITH AUTOMATIC SKAG.

IMPORTANCE OF SOFT WATER FOR DOMESTIC PURPOSES.—The importance of soft water for domestic purposes is illustrated by the experience of a large London asylum, in which a change from hard to soft water has resulted in an estimated annual saving in soda, soap, labor, etc., of more than four thousand dollars.

Fishing by the Electric Light.

Some interesting experiments in connection with the subject of fishing, the *Scotsman* states, have been carried on in the Firth of Forth. It has long been understood that fish are strongly attracted toward any bright light—a fact utilized by the salmon night fisher, who uses a flaming pine torch to bring the prey within reach of his "leister" or spear; and it is proposed under this system to employ, by way of lure, the powerful light of the electric lamp. A number of gentlemen having obtained the use of the steamship Tweeddale, have had her completely fitted out for the purpose with electric apparatus, engine, and dynamo, arc lamps of 6,000 candle power, incandescent submarine lamps, etc.

Recently the vessel, thus equipped, was engaged in her novel fishing cruise in the neighborhood of the Isle of May. The experiments, however, have not so far been successful. The electric lamps were sunk with the beam of the net to a depth of 40 or 50 fathoms, the glass globe being about three-eighths of an inch thick. Operations were carried on for about an hour on two occasions, and it was found that the pressure of the water was too great for the strength of the glass, the result being that the lamps broke, and the light instantly went out. It is intended to renew the experiments, using stronger glass.

The International Exhibition of Glasgow, in the Year 1888.

An international exhibition of industry, science, and art is to be held in Glasgow, Scotland, extending from May to October, 1888. The usual patronage of Queen Victoria, the Prince of Wales, and other notabilities is cited in the prospectus. A guarantee fund of over 250,000 pounds sterling has already been subscribed. For the exhibition buildings a site of over 60 acres area has been granted by the city of Glasgow. There is every prospect of the exhibition being a great success. The grounds are intersected by the river Kelvin, 90 feet wide, 86 feet deep. This stream, it is suggested, may be utilized for marine exhibits. The general plan of the display includes 22 classes, covering every kind of product. In addition to these, there are two divisions of special interest. One is the women's industries sections, the other the artisan section. For these and for the fine arts section no charge for floor space will be made. The list of regulations for exhibitors seems very well conceived, and imposes no annoying restrictions. The council believe that the simple exhibition of the articles in so important a center as Glasgow should be a sufficient incentive to secure large contributions from all parts of the world. There is no reason to believe otherwise. The city and its suburbs represent 1,500,000 people of a great manufacturing center. A peculiarly favorable opportunity appears to be offered to American manufacturers to introduce their work to the great makets of Scotland and England. No awards are, according to present intentions, to be made to exhibitors. Communications should be addressed to Charles H. Seligman, Esq., of Glasgow.

FORESTS cover twenty-four per cent of the entire area of Norway

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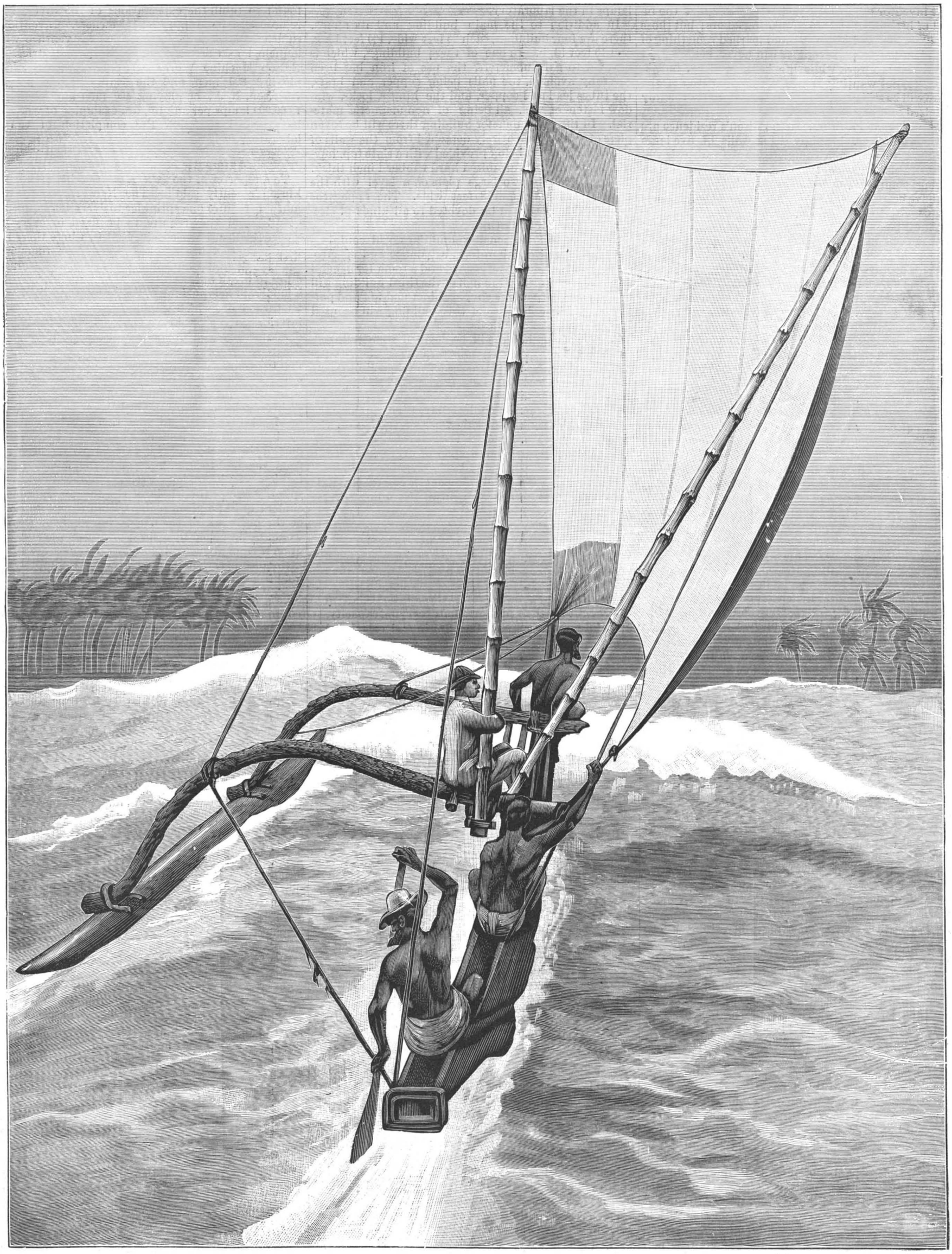
A SINGHALESE YACHT.

In these days of yachting we have thought it might be of interest to our readers to see what sort of a yacht they sometimes use in Ceylon.

The fishermen (who form a caste of their own) in Ceylon lead a somewhat hazardous existence. They frequently run great risks when the waves break heavily over the reefs by which the island is almost entirely surrounded. That they earn their bread by the sweat of their brow the enterprising traveler will be easily convinced of if he is rash enough to accompany Singhalese fishermen on one of their trips, as they are generally out for hours during the heat of the day. The boats have in themselves no stability, having only about 8 inches beam, and are kept from capsizing by an outrigger. In the event of a heavy squall, when the outrigger is not sufficient for the preservation of stability, one of the crew acts as shifting ballast, and perches himself on the outrigger—this is called a one man breeze. A two man breeze is serious work. The construction of these boats enables them to run over the shallow reef water, and our sketch shows the passage of a river bar under sail, the boat being rushed through the "white horses" at a rapid pace under the freshening gale. It is rather exciting work when, amid the green rollers on the bar, naught of the land can be seen in dipping save the tops of the cocoa nuts that fringe the shore. The Singhalese fishing boat has a graceful motion, but it is best admired from *terra firma*. He who takes a trip in one of these craft invariably has a pensive feeling on return, followed by complete prostration, but still it is a sensation worth undergoing. Our engraving is from a sketch by Colonel H. G. Robley, commanding First Argyle and Sutherland Highlanders.—*London Graphic.*



A CEYLON SURF BOAT.

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Edison's New Laboratory.

A visitor at Orange, N. J., will notice in the beautiful Llewellyn Park, about a quarter of a mile from the main entrance, a palatial residence of Queen Anne style, with porte-cochère, conservatory, and large grounds beautified by the landscape gardener. This is the residence of Edison. Here one would think the great inventor might retire and enjoy in quiet the reward of his genius and of his untiring labors; but those who have followed his career and learned something of his indefatigable perseverance can never believe that he will cease to work while life lasts. Indeed, indications are not wanting that the characteristics of the future will be still greater activity and more thoroughly organized and better directed effort.

Not more than half a mile from Edison's residence are the foundations and rapidly rising walls of five large buildings, which, when completed and furnished, will constitute his laboratory. It will probably be the largest and most complete private laboratory in the world. Orders have been placed for the physical and chemical apparatus with the best makers in America and Europe. The finest machinery for all uses has been ordered, and will soon be in place. No purely historic apparatus or machinery has been purchased. Everything will be on a practical basis. The range of the laboratory will be extremely wide and diversified. Any experiment relating to anything of which we have any knowledge may here be tried speedily and with all possible precision. The laboratory is exclusively for Mr. Edison's own use, and will be wholly applied to perfecting his inventions and putting them in commercial form.

It may here be said that Mr. Edison makes no claims to the title of scientist. He is simply and purely an inventor, and as such is determined to see his inventions embodied in practical form in the shortest possible time after they have been conceived. He will employ a corps of competent men, and will have rough and finished material of all sizes and descriptions.

The main building of the laboratory is 250 feet long, 50 feet wide, and three stories high. It will contain on the lower floor a complete machine shop, provided with lathes of all descriptions and various sizes, from 60 inches down, planers, milling machines, gear cutters, and all varieties of machines required for working iron, steel, and other metals. This shop is driven by a 40 horse power engine, built by Brown, of Fitchburg, Mass. Upon the second floor of the main building there will be a grinding and polishing department, which will include the grinding of all tools, gear cutters, reamers, mills, mandrels, and arbors, lapidary work, lens grinding, etc. Upon this floor there will also be a room devoted to photography, another devoted to drawing, another to machinery and instruments of precision. Here there will be a large dividing engine for circles, another for bars. There will be three experiment rooms, in which apparatus made in other parts of the laboratory will be experimented with and perfected. Upon this floor the power will be distributed by electricity, a motor being placed at each machine. A 100 volt electrical conductor will extend all over the laboratory, and the motors will range from one-tenth horse power to three or four horse power. In each experiment room there will be a table provided with pipes for supplying city gas, fuel gas, compressed air, cold water, hot water, steam, and hydrogen. There will also be here, as elsewhere throughout the entire laboratory, wires for conveying electric currents, varying in electro-motive force as follows; One 3 volt conductor, one 1,200 volt, one 100 volt, and one 8 volt. In addition to the wires for conveying currents to the various parts of the laboratory, there will be portable batteries of various kinds, suited to different work.

The top floor of the main building is devoted mostly to fine apparatus. There will be 34 cases for such apparatus, each 2 feet 4 inches wide and 21 feet long. There will be about $18,000 worth of apparatus of this sort in this department. The apparatus has been ordered from such makers as Edlemann, Hartman & Brauhn, Lattimer, Clark & Muirhead, Siemens Bros., Carpentier, Societe Genevoise, and, in fact, from all the principal makers. Among the apparatus there will be a large Ruhmkorff coil, a Dubosc phosphoroscope, a Foucault photometer and heliostat, and photometric apparatus of every variety; spectroscopes, and Sir William Thomson's absolute electrometer and quadrant electrometer; a telescope having an Alvan Clark objective and provided with a Young spectroscope, the telescope being mounted equatorially by Fauth; a spectrometer costing $1,200, a micrometer costing $200, a Fauth chronograph. Upon the upper floor there will also be a room for projection, 50×40 feet and 16 feet high. A lantern is being made which will utilize the light of a 5,000 candle arc lamp. Upon this floor there will also be a pump room for lamp experiments, a glass blower's room, and a room for jeweler's work. In the line of mechanics, the laboratory will be able to produce any kind of machine varying in size from that of a locomotive to that of a watch. The main building will contain a large scientific library.

In an annex to the main building will be placed three Babcock boilers, 75 horse power each. In this room will be placed a 14½×15 Armington & Sims high speed engine, one 12×13 Armington & Sims high speed engine, and four dynamos driven by these engines. The dynamos during the day will be employed in testing incandescent lamps and in other work of the laboratory, and during the night they will be employed in furnishing a current to about 1,000 incandescent lamps in Llewellyn Park and 300 lamps in the laboratory.

In addition to the main building and its annex, there are four buildings, each 25 feet wide, 100 feet long, and 16 feet high. In one of these buildings, which is devoted to galvanometers, the use of iron has been carefully avoided, the nails being copper and brass, the tubes lead and copper, and the hinges, locks, window fasteners, etc., all being of non-magnetic material. In the galvanometer building there will be seven piers of solid stone entirely detached from the walls of the building, each being provided with a slate top, having a covering of vulcanized hard rubber 1 inch thick. There will also be two large piers on a level with the floor, 15 feet long and 8 feet wide. The apparatus used in this room will be devoted to all kinds of electrical and magnetic testing.

The second of the smaller buildings will contain a complete chemical laboratory, a balance and spectroscopic room, an analytical room, and a room for general experimental work. One-half of the third building will be used as a carpenter's shop, cabinet making and pattern shop. The balance of this building will be used for the storage of chemicals.

The fourth building will be devoted to metallurgy. It will contain a five stamp mill, a Blake crusher, a 6,000 ampere dynamo, and furnaces of various kinds. It will be supplied with fuel gas from a 40 barrel gasoline gas-producing machine.

$6,262 worth of pure chemicals have been purchased, a quantity of every known substance on the face of the globe has been ordered; all kinds of ores, metals, fabrics, gums, resins, and samples of every imaginable material.

The following is a small fragment of one of Mr. Edison's lists of materials, the entire list filling several volumes:

2 lb. horsetail hair.
2 " hogs' bristles.
5 " cows' hair.
2 " rabbit hair used by felt hat makers.
1 " common goat hair.
10 " best sheep's wool.
1 oz. mink hair
2 " human hair.
4 " porcupine quills, assorted.
1 " camel's hair, fine.
1 " " " coarse.
1 mink skin, hair on.
1 coon " " "
1 deer " " "
1 " " " off.
1 sable " " on.
1 fox " " "
1 cat " " "
1 " " " off.
1 dog " " on.
1 " " " off.
1 seal " " on.
1 " " " off.
1 bear " " on.
2 squirrel skins, hair on.
1 rabbit skin, hair on.
1 " " " off.
4 sheep skins, tanned.
2 rawhides (bulls').
2 hides, French kip.
2 " thick sole leather.
1 doz. chamois skins.
1 walrus hide, tanned.
2 common leather hides.
2 hides, patent leather (best).
½ doz. ostrich feathers.
100 goose quills.
100 assorted hen feathers.
½ oz. swan down.
1 peacock tail.
5 lb. hops.
1 bu. barley.
1 " oats.
1 " wheat.
1 " rye.
1 " buckwheat.
1 bu. beans (common).
1 " peas (common).
50 lb. bran.
50 " oatmeal.
1 bu. corn (shelled).
1 bbl. flour (wheat).
1 " flour (rye).
1 " buckwheat flour.
1 bag corn meal.
50 lb. rice.
5 " assorted ivory.
1 doz. walrus tusks.
1 " bulls' horns.
1 deer horn.
2 oz. sharks' teeth.
½ " small tortoise shells.
½ " common turtle shells.
1 large turtle shell.
50 lb. horse hoof.
50 " cow hoof.
6 sp. white sewing silk, each size, from largest to finest.
2 lb. unspun white silk, reeled on bobbin.
2 bobbins of silk from cocoon.
6 sp. each of finest to coarsest cotton sewing thread.
2 lb. worsted skeins, assorted sizes (white).
1 " shoemaker's wax.
1 " " cord.
5 balls each of finest to coarsest cotton twine.
6 " each of finest to coarsest linen.
25 lb. marlin.
50 fish lines, assorted.
50 lb. clothes line.
2 " best book ink (printer's).
10 " common printer's ink.
1 " each of printer's ink (every color).

Metals, moulding sand, lampblack, pumice stone, rotten stone, oils, soaps, mica, sugar, glycerine, glucose, dextrin, cork in all shapes, etc., etc.

This is a heterogeneous list, but since a complete list will comprise all known substances, these things must necessarily be included. Mr. Edison proposes to have on hand, at the time of the opening of the laboratory for work, materials of all kinds now known, in sufficient quantity to last for five years' experimentation. This enterprise has been a dream of Mr. Edison's since his youth. The realization of it is now rendered possible by the great success of his inventions.

The present buildings were started on the 5th of July, in the present year, and will be finished and ready for occupancy November 1. The cost of the buildings and their contents will be $180,000. The working force of the laboratory will comprise forty skilled men, aside from Mr. Edison and his first assistant, Mr. Batchelor.

The method of developing an invention will be as follows: Rough sketches will be submitted to model makers, who will secure from the vast supplies of material blanks for the necessary parts, or possibly completed pieces for the apparatus, and as many workmen as can be employed to advantage will be at once detailed for the work, and thus the working model will be brought out in a very short time. Any improvements necessary are then made, working drawings are prepared, the necessary patterns and castings made, and the complete, full sized machine or apparatus is at once constructed, tested, and if it is found to fulfill the expectations of the inventor, it is removed to be duplicated elsewhere. Inventions of sufficient magnitude to warrant the venture will be launched as the bases of separate industries. The Edison Machine Works at Schenectady, N. Y., employing 800 men, and the Edison Lamp Works at Harrison, N. J., employing 400 men and turning out 1,000,000 lamps per annum, are examples of what may be expected to follow the completion of the new laboratory.

Automatic Sprinklers for Theaters.

To a reporter of the *Pall Mall Gazette* Edward Atkinson recently said: "The New England factory mutuals require one sprinkler to every 100 square feet of area, and they require to be fixed in every place where the fire risk comes in, that is, where there is the first danger of fire breaking out. In a room 20 feet square you would have four sprinklers, and supposing a fire to break out, as soon as the temperature reached a moderate height, four taps at a high pressure would be turned on, which would convert the whole of the interior of the room into a shower bath. I cannot understand why you do not adopt the sprinklers in the theaters. Were the proprietors of the theaters in London to organize a mutual association, as the mill owners of America, the buildings could be made fireproof with little outlay. I would undertake to organize such an arrangement of sprinklers as to secure the following result: I might even fill your theater with a crowded audience, and then I might set a fire on the stage as a part of the spectacle. Not a single person need move from the auditorium, but watch the flames rise in a fashion which, under existing circumstances, would speedily reduce the whole of the theater to a mass of cinder; but at a given point, within a minute or two of the outbreak of the flames, the whole of the stage would be drenched by a sheet of water pouring down upon it from above and the sides in such a way as to extinguish every spark of fire in a few minutes, or to hold it in check until the firemen could complete the work."

AN INEXPENSIVE INDEX PLATE.

Mechanics generally, and amateur mechanics especially, often have occasion to divide a circle, as in gear cutting or fluting a reamer. To those possessing a gear cutter, or gear-cutting attachment to the lathe, it is very easy, but to one who has no conveniences for such work it is quite troublesome. It is not an easy matter to lay out and drill an index plate. It is comparatively easy to copy a plate, but the plate is not always accessible.

To enable the amateur to avail himself of the use of an index plate with little expense, the annexed photo-engraving has been prepared from a useful plate, and other engravings have been added, showing the application of the plate to a lathe. This print is designed to be cut from the paper and pasted on the metallic plate, B, and the plate is to be attached to the face plate, C, of the lathe, as shown in Figs. 2 and 3. It is important to center the plate with the paper impression accurately in the lathe. For this purpose a center mark and two circles have been provided. The metallic plate should project at least one-fourth inch beyond the paper disk, to receive the clamp by which the plate is held while the cutting is being done.

The following is a table of the divisions that may be made with this plate:

240, 200, 150, 144, 132, 124, 120, 112, 108, 104, 100, 92, 84, 80, 75, 72, 66, 62, 60, 56, 54, 52, 50, 48, 46, 44, 42, 40, 38, 36, 33, 31, 30, 28, 27, 26, 25, 24, 23, 22, 21, 20, 18, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2.

Below is a table of the divisions of each circle:

240	200	150	144	132	124
120x 2	100x 2	75x 2	72x 2	66x 2	62x2
80x 3	50x 4	50x 3	48x 3	44x 3	31x4
60x 4	40x 5	30x 5	36x 4	33x 4	
48x 5	25x 8	25x 6	24x 6	22x 6	
40x 6	20x10	15x10	18x 8	12x11	
30x 8			16x 9		
24x10			12x12		
20x12					
112	**108**	**104**	**92**	**84**	**76**
56x2	54x2	52x2	46x2	42x2	38x2
28x4	36x3	26x4	23x4	28x3	19x4
16x7	27x4	13x8		21x4	
14x8	18x6			14x6	
				12x7	

Referring to the engraving, A is the paper disk which is attached to the metal plate, B, by means of fine starch paste or a mucilage made from gum tragacanth. The plate, B, is secured to the face plate, C, of the lathe by three screws. After the plate is centered and fastened, the center is cut away to allow the blank-holding spindle, O, to enter the lathe mandrel in the place of the usual center.

A bar, D, which is preferably made of cast iron, but which may be made of wood, is secured to the lathe by

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a bolt passing downward through the lathe bed and through a crossbar underneath. The bar, D, is provided with a standard, E, which extends behind the plate, B, about one-fourth inch. To the front of the standard, E, is loosely attached a jaw, F, by means of dowel pins. This jaw extends over the face of the plate, B, about one-fourth inch, and is made to bear upon the plate, and thus clamp it to the standard by means of the thumbscrew.

On a screw, K, extending into a standard, I, projecting from the bar, D, is pivoted an arm, J, having an enlarged end, *a*, in which there is an aperture a little larger in diameter than one of the circular dots on the index plate. The arm, J, may be swung opposite any row of dots on the plate, B. The registering of the plate is accomplished by bringing the dot opposite the hole in the index, so that an annular space is seen around the dot through the hole in the index. The hole should be countersunk and the index should be allowed to touch the plate lightly. A magnifying glass assists greatly in securing a perfect registration. As most wheels will be cut with teeth numbering aliquot parts of the rows of dots, the chances of inaccuracies will be correspondingly decreased, but in such a case errors may arise in the counting of the dots for a new position of the plate. To guard against such errors, a clamp, M, is provided which embraces the edge of the plate, B, and carries a pointer, N, which is pivoted, so that it may be made to point to a dot in any of the rows of dots. Suppose it is required to cut a wheel, the teeth of which would require the use of only one in four of the dots of a given circle; then after moving the plate and clamping it fast by means of the screw, the clamp, M, would be moved back four dots, and after the wheel was cut the screw, G, would be loosened and the plate, B, would be moved until the dot pointed to by the pointer, N, would be seen in the center of the hole in the index, J. The metal around the hole at the side and upper part of the index, J, is cut away to allow the pointer, N, to pass downward opposite the center of the hole.

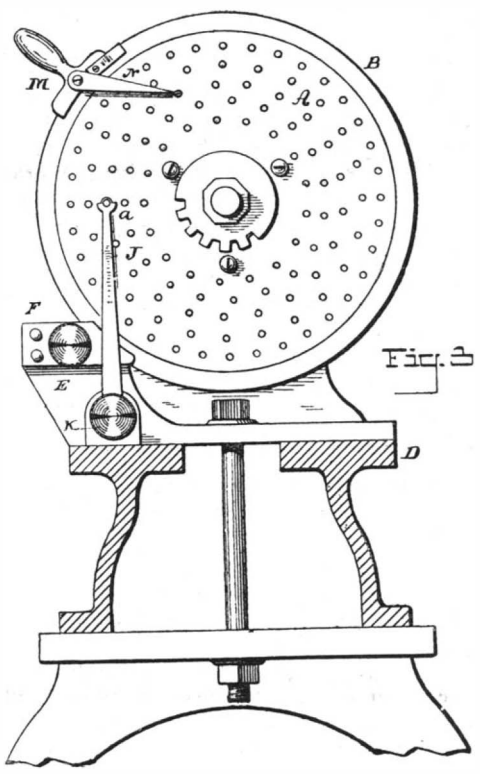

Fig. 3.

FIG. 3.—FRONT ELEVATION OF PLATE APPLIED TO THE LATHE.

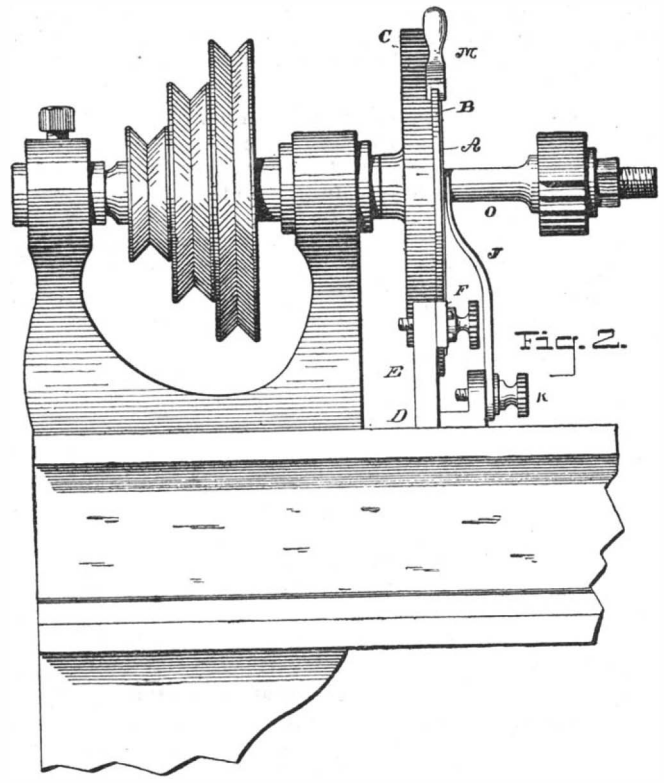

Fig. 2.

FIG. 2.—SIDE ELEVATION OF LATHE, SHOWING APPLICATION OF INDEX PLATE.

As to the method of cutting small gears in the foot lathe, the reader is referred to SUPPLEMENT, No. 317, "Amateur Mechanics."

Each row of dots may be divided up as follows, the heavy faced figures at the top of each column in the above table representing the whole number of dots in each row, while the figures below represent aliquot parts of this number. The figures in each column indicate how many spaces it is necessary to move the plate each time the wheel blank is to be shifted for a new cut to produce the number of teeth directly opposite in the other column. For example, in using the outer row of dots, if it is desired to cut 80 teeth, the plate must be moved three dots for every tooth, for 60 teeth four dots, and so on; or to reverse the order, to cut 3 teeth the plate must be moved 80 dots, and for 4 teeth 60 dots.

It is possible by the exercise of due care in registering and clamping to produce very good work with this inexpensive apparatus. G. M. H.

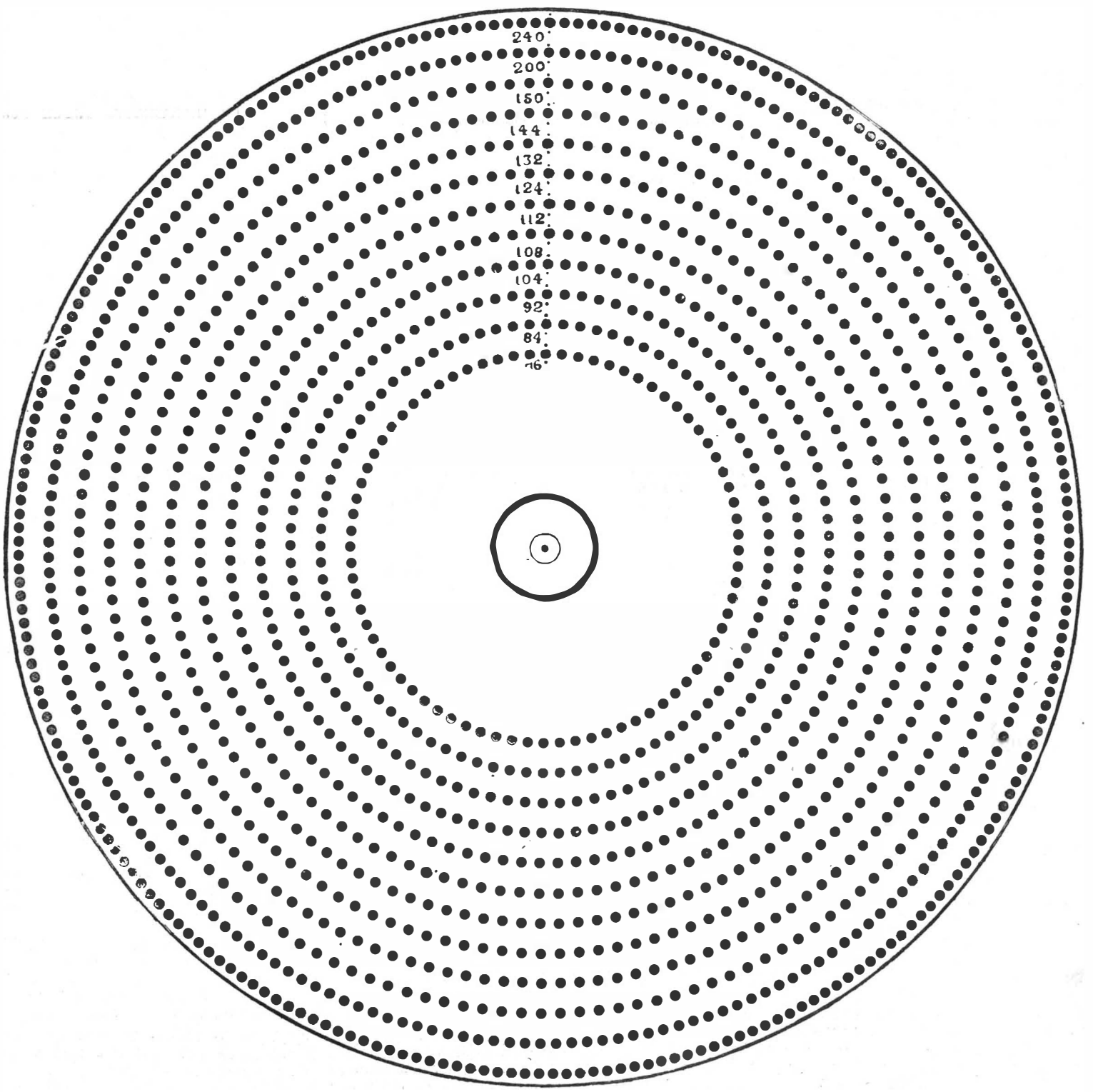

FIG. 1.—AN INEXPENSIVE INDEX PLATE.

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ENGINEERING INVENTIONS.

A steam engine has been patented by Mr. Peter S. Rush, of Atlanta, Texas. It has three cylinders, the pistons of which are connected in the usual way with the main shaft, steam being supplied by rotary valves as their ports are uncovered in such way as to obviate a dead center position, while the pressure of the live steam will be advantageously utilized.

A car step has been patented by Mr. Lewis W. Sheldon, of New York City. Combined with a lower main step having vertical slots in its riser is an auxiliary step with side pieces to pass through the slots when the step is folded, a strap hinge connecting the top of the riser of the auxiliary step with the lower main step, with other novel features, making a convenient folding step.

A pinch bar has been patented by Mr. John S. Yinger, of Manchester, Pa. The bit has a shank bearing against the under side of the bar proper, and a point or prong extended at approximately a right angle from the forward end of the shank, with guide lugs and fastenings, the device being very simple, and intended to act without slipping when ice, snow, oil, etc., may be on the rail.

An injector has been patented by Mr. Ferdinand Brunbauer, of Vienna, Austria-Hungary. It has two concentric steam tubes, the inner one endwise movable, forming a steam way of ring shaped section, adapted to operate a cut-off valve by the movement of the inner tube, in combination with a fixed conical valve for the inner tube, a valve seat on the tube, and means for adjustment of the tube, with other novel features.

A car truck has been patented by Mr. Ferdinand E. Canda, of New York City. It is more especially for use in mounting street car bodies, and is so designed that the car body is mounted upon and supported by posts that are free to tilt upon their connections with the car trucks, providing for the more easy passage of the car around curves, and for mounting the two pairs of wheels farther apart, with other advantages.

AGRICULTURAL INVENTION.

A hay stack binder has been patented by Messrs. David F. Laughlin and Charles F. Leslie, of Clyde, Kansas. It is a cord or wire tightening device, adapted to be conveniently carried around, and to be readily attached to the binding cords or wires and take up the slack until they are securely tied around the stack, to prevent hay from being blown away or scattered by high winds.

MISCELLANEOUS INVENTIONS.

A trunk harness has been patented by Mr. Charles H. Van Orden, of Catskill, N. Y. It is a binding device for trunks, boxes, etc., so made as to go around and have a tightening strap or rope applied for easily drawing the harness tightly.

The manufacture of emery forms the subject of a patent issued to Mr. William Ihne. It consists in first burning, then cooling and afterward reducing, iron ore or raw iron outcroppings, or material composed mainly of silica and aluminum, and subsequently separating and sifting it into different grades.

A lubricator has been patented by Mr. George Rupley, of Duluth, Minn. It is a novel form of lubricator applicable for use in connection with fixed bearings, having a cup and piston with threaded stem so arranged that by turning a nut the lubricating material will be forced out to the bearing.

A mantel cabinet has been patented by Mr. William C. Doscher, of New York City. The base is provided with sliding blocks in combination with ornamental corner pieces adjustably attached, whereby the cabinet may be made to fit a mantel of any width and always present a handsome appearance.

A refrigerating device has been patented by Mr. Henry W. Speight, of Brooklyn, N. Y. It consists of an inner receptacle around which the cold waste water from an ice box is made to circulate, being especially adapted for butchers' use in keeping meats cool at small cost.

A sand box for street cars has been patented by Mr. Charles Clark, of Brooklyn, N. Y. It is held beneath the seat, over an opening in the floor of the car, in combination with a vertical and horizontal tube, and a valve under the control of the driver, for supplying the track when needed, as in the case of freezing weather or when the tracks are slippery.

A paper box has been patented by Mr. John F. Diemer, of Elizabeth, N. J. The box body has flaps which are locked in place on a metallic plate of peculiar construction, the box opening at one end so that it can be used single or with a sliding box for various purposes, especially for storing letters and other documents.

A curtain shade fixture has been patented by Mr. Robert P. Trimble, of Oregon, Mo. It is for sustaining the curtain shade roller and lambrequin rod at the upper part of the window in such a manner as to permit the same to be quickly applied or removed and adjusted higher or lower, as may be required for purposes of better ventilation.

A railway spike and method of making it has been patented by Mr. Thomas A. Davies, of New York City. It is a plate spike, with a general taper for its entire length, and formed with a diagonal head, a tapering plate being first formed with a flange at one edge, and the blank then being cut into narrow strips diagonally across from edge to edge.

A brick kiln has been patented by Mr. Lawarance Manning, of Nokomis, Ill. The invention consists of a draught pipe leading from the outside to the pit, so as to concentrate the heat either in the center of the arch part or on both sides of the kiln simultaneously, for burning the bricks quickly in the centers as well as at the sides of the kiln.

A chemical fire kindler has been patented by Mr. Nils Johanson, of Muskegon, Mich. It is made by pressing in a conical mould a small quantity of "excelsior," such as used in the furniture trade, inclosing it in a binder of zinc, then immersing the pointed half in liquid paraffine and the base half in resin.

A weighing scale has been patented by Mr. George W. Craig, of Grimm's Landing, West Va. This invention provides a framework and weighing apparatus designed more particularly for weighing heavy bodies, as railway cars and locomotives, loaded wagons, live stock, etc., and one which is of simple and cheap construction and accurate means for adjustment.

A composition to be used as a non-conductor of heat has been patented by Mr. Nicholas J. Clayton, of Galveston, Texas. It consists of cotton-seed hulls or waste treated with a solution of alum or its equivalent, combined with plaster of Paris and comminuted materials, and prepared for use in a manner specially described.

A pie holder has been patented by Mary Jory, of Salem, Oregon. It consists of trays within a specially devised frame for holding them one above the other, the frame being composed of a strip of metal bent twice at right angles, with its extremities parallel with each other and its central part forming a handle.

A wire cloth delivering reel has been patented by Mr. Silas E. Ratekin, of Kansas City, Mo. It consists of a vertical post to which is pivoted a roll holder capable of being turned from a vertical to a horizontal position, making a reel for properly supporting such rolls for exhibition, and for delivering portions of the fabric therefrom.

A camera stand has been patented by Mr. Thomas Powers, of Perryville, Mo. The bed is made capable of being raised or lowered and of being adjusted to occupy different angular positions, the invention covering a novel construction, with certain automatic stops for operating the bed or platform and for holding it at its different adjustments.

A grater cylinder has been patented by Mr. Sidney E. Smith, of Brooklyn, N. Y. It is designed for grating cocoanut, vegetables, and other substances, the cylinder being formed with numerous passages in which are inserted short plates of metal to form teeth, the device being cheaply made and very effective.

A fire escape has been patented by Mr. Edward Sutton, of Brooklyn, N. Y. It consists of a frame provided with cleats and holding a ladder, together with rods, a pulley, shaft and drum, with ratchet wheel, ropes, and various other features, which can be easily placed in readiness for firemen to ascend or to lower persons from a burning building.

An amalgamator has been patented by Mr. Carl M. Stolle, of Bellevue, Idaho Ter. It has tapering cylinders, to facilitate the passage or tailings from one end to the other, and they are of polygonal form, to cause the tailings to be thrown from one plane surface to another with a force which promotes separation of the gold and its adherence to the plates.

A fastener for envelopes, etc., has been patented by Mr. Paul E. Gonon, of New York City. The fastener consists principally of three parts, an elastic band, a clamp provided with prongs and longitudinal slits, and a hook or button, the clamp being secured to the flap of the envelope by pressing the prongs through the material and then bending them flat on the inner side.

A pocket book clasp has been patented by Mr. Louis B. Prahar, of Brooklyn, N. Y. It has an outer sliding plate and an inner plate, in combination with an intermediate plate formed with an opening and with integral tongues set out from the face of the plate to form friction springs at the side of the opening, the device being cheap, practical, and not liable to get out of order.

A knockdown crate has been patented by Mr. John T. Aikin, of Purdy, Mo. The invention covers certain novel features of construction and the combination of parts in a crate adapted for the shipment of produce or general merchandise, which shall be simple and inexpensive, and may be knocked down into comparatively small space for return to the shipper.

A support for electric conductors has been patented by Mr. Maurice J. Hart, of New Orleans, La. The invention contemplates the erection of towers at the intersection of streets of sufficient height to support all electric conductors above the top of the highest buildings, with intermediate posts supporting girders, the construction being also adapted for supporting water pipes and for use as a fire escape.

An improved boot top and method of forming it have been patented by Mr. John T. Gray, of Gray, Dakota Ter. The invention consists principally in forming the front section with a fold or swell adjacent to the lower ends of its edges at the rear of the vamp, whereby the vamp may be quickly fitted to the concave waist of a last without straining the leather.

A bridle blind has been patented by Mr. William W. Ross, of Saratoga, Kansas. Its side leathers have extensions for attachment to the check straps, in combination with a stiffening wire bent in a curve and interposed between the leathers, in such way that the wire acts to stiffen the blind and thus dispense with the necessity of a stiffening plate in the body of the blind.

A tension regulating attachment for loom shuttles has been patented by Mr. Pierre Ashby, of Central Falls, R. I. It is of metal, and consists mainly of a U-shaped case in which is mounted a tongue, apertures adjustable relatively in the case and tongue affording means of varying the tension from the bobbin as desired, making greater uniformity in the weaving of the cloth, especially at the side edges.

A nut lock has been patented by Mr. George W. Roberts, of Walla Walla, Washington Ter. Combined with a slotted bolt and nut is a locking piece consisting of a short heavy shank, formed on its end with an oblong eye, the interior surface of which flares at the ends to correspond with the taper of the upper side of the conical section of the bolt, and at the sides to correspond with the taper of the sides of said conical section, with other novel features.

A machine for drawing metals has been patented by Mr. Henry R. Kennedy, of Ithaca, N. Y. Combined with a revolving cup having a central aperture and a central annular recess are balls held in the recess and placed alongside of each other, a die having a central aperture and serving to hold the balls in place, and a fixed stripping plate having a central aperture located above the die, with other novel features, making an improved machine for drawing sheet metal, tubing, or wire.

An anti-freezing device for water pipes has been patented by Mr. Donald McDonald, of Louisville, Ky. Combined with a stationary case and attached hollow base with valves connecting with the water pipes, a floating weight is arranged to act on a lever, while an air pipe connects with the top of the case with means for automatically admitting air on a fall of temperature, together with other novel features, the invention being an improvement on a former temperature alarm device of the same inventor.

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SEPTEMBER NUMBER.

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1. Elegant Plate in Colors of a Twelve Hundred Dollar Cottage, with floor plans, specifications, sheet of details, bills of estimate, etc.
2. Plate in Colors, with specifications, estimate, and bill of materials, for a Southern Residence of moderate cost. An elegant design.
3. Handsome design for a Library Building.
4. Perspective view, with floor plans, for a Dwelling costing Five Thousand Dollars.
5. Drawing in perspective, with floor plans, for a Cottage costing Thirty-five Hundred Dollars.
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8. A handsome Dwelling costing Four Thousand Two Hundred Dollars. Perspective and floor plans.
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10. Perspective view and floor plans of Grace Memorial House, Providence, R. I., a School House, and Nursery. Cost, Four Thousand Dollars.
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15. Floor plans, elevations, and perspective view of an Eight-room Ohio Dwelling, costing about Five Thousand Dollars.
16. Elegant design for a Bank Building at Knoxville, Tenn.
17. Design of the Yankee Cottage now at the American Exhibition, London.
18. Design for Elegant Residence of C. C. Bloomfield, Esq., Jackson, Mich. Two half page drawings, showing view in stair hall, perspective, and floor plans.
19. Interior view of Stable with horizontal floors and hygienic drainage. Three illustrations.
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NEW BOOKS AND PUBLICATIONS.

SELECT POEMS OF ALGERNON CHARLES SWINBURNE. New York: Worthington & Co. Pp. 230. $1.50.

Algernon Charles Swinburne is one of the most remarkable poets of the present age, and few have written more beautiful verse than some of the poems here produced. He has many cultured and very devoted admirers, who will welcome this collection.

ELECTRICITY TREATED EXPERIMENTALLY. By Linaeus Cumming, A.M. New York, 1887. D. Van Nostrand. Pp. xiii., 389.

This work, designed for use in instruction in high schools, is to be highly recommended. It gives an extremely clear view of the subject matter, with a number of illustrations. The cuts are many of them old friends, as is necessarily the case, but others are new, and all are apposite and appropriate. After treating of magnetism, static and dynamic electricity, a concluding chapter is devoted to absolute units in the C. G. S. system. A table of contents is provided, but no index accompanies the work.

CHOIX DE METHODES ANALYTIQUES DES SUBSTANCES QUE SE RENCONTIENT LE PLUS FREQUEMMENT DANS L'INDUSTRIE. Par Georges Krechel. Paris, 1887. George Carre. Pp. 477.

In this book the author proposes to furnish to practical manufacturers methods for analysis of the general class of commercial products. His work is hardly intended for professional chemists. It gives one method which the author has selected as the best for each analysis, so that the user has not to choose from a variety, but has a suitable process at once presented. The objects to be analyzed are treated under the general divisions of inorganic and organic, and a great deal of ground is thus covered. Though the modesty of the author is discernible in his preface, where his tendency is to restrict the

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use of his book to others than expert chemists, yet we should consider the work a most useful laboratory companion, often giving valuable hints toward a more elaborate method than the one prescribed.

TEN THOUSAND MILES ON A BICYCLE. By Karl Kron. New York, 1887. (Published by author.) Pp. cvii., 800.

Our best recommendation of this work is to say that we find it very hard to convey any idea of its variety to a short notice. The author has conveyed so much of his very marked and interesting personality into every page, his reading and notes and views of men and things crop out so profusely, the interest never flags. Though ostensibly devoted to an account of ten thousand miles made on his 'cycle, "No. 234," it is an *olla podrida* of endless variety. The matter contained cannot be estimated by the number of pages. The small and exceedingly clear type makes it contain the substance of three or four volumes of respectable size. His accidents with his machine, from his first ride of one rod, resulting in a broken elbow and damaged machine, the cost of which ride he puts at $234, to the entanglement with a tow rope on the canal path and the runaway of the mules with the 'cycle, are all graphically told and described at length. Chapters on other long-distance riders, a list of his original 3,000 subscribers to the book (copartners he calls them), and a variety of other matter are included. Those who enjoy thoroughly characteristic books will appreciate the one under review. Exhaustive indexes of persons and things are contained also.

TORNADOES: WHAT THEY ARE AND HOW TO OBSERVE THEM, WITH SUGGESTIONS FOR THE PROTECTION OF LIFE AND PROPERTY. By John P. Finley, U. S. A. New York: The *Insurance Monitor*. Pp. 196. $1.

The author, a lieutenant in the signal corps, gives us the result of years' study and observation of this class of storms, in a sketchy and narrative form, with compilations of data from the Signal Service reports, and many illustrations, a considerable number of which are reproductions of views taken by instantaneous photography. The peculiarities of some of the most memorable tornadoes are noticed, on the testimony of eye witnesses, and their destructive effects are shown by several views of the ruin they caused. A chart showing the average distribution of these storms over the United States for many years gives, as the location of their greatest frequency, a district on either side of the Missouri River, from Omaha to Kansas City, embracing portions of Iowa, Nebraska, Kansas, and Missouri. A small section just east of the southern end of Lake Michigan has also been very frequently visited, as has also a larger area in northern Georgia and Alabama, and western South and North Carolina, while in Virginia, West Virginia, and Kentucky such visitations have been quite infrequent.

* * Any of the above books may be purchased through this office. Send for new catalogue just published. Address Munn & Co., 361 Broadway, N. Y.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) M. P. R. writes: I have played on a B flat cornet over a year, and I have had considerable trouble with my lips, especially when playing high notes; they seem to be very soft instead of being hard, which they should be. What will harden them? A. Try aromatic wine, which you can purchase from any druggist. The preparation is made as follows: Take of rue, sage, hyssup, lavender, absinth, rose leaves, thyme, and elder flowers, of each, 4 ounces. Digest for two weeks in 9 pints of claret. Then add tannic acid, alum, and wine of opium, of each 9 ounces.

(2) F. W. asks how to stop out pin holes in a negative. A. Touch them out with a soft lead pencil, such as is employed by retouchers. Formula for a toning solution giving dark tones is as follows:

Chloride of gold	1 grain.
Sodium carbonate	10 grains.
Water	10 ounces.

Use immediately after mixing.

(3) L. F. D. asks (1) what Strassburg turpentine is. A. Strassburg turpentine is made of European silver fir; it is much used in Germany, and any large druggist should be able to get it for you. 2. A good receipt to make an imitation of the imported gin. A. Dissolve 3½ drachms oil of juniper in sufficient 95 per cent alcohol to make a clear liquid; add to it 40 gallons French spirits 10 above proof, with 8 ounces orange peel flavoring, 1 quart sirup, and 30 drops oil of sweet fennel. Brannt on Distillation gives many recipes and directions for making gins, etc. We mail it for $2.50.

(4) F. W. B. asks: How many pint cells of the plunge battery described in SCIENTIFIC AMERICAN of August 20, 1887, page 116, connected in series, will run an Edison 1 candle power incandescent lamp? A. Four cells would run a one candle lamp brilliantly. 2. And about what is the electromotive force in volts of each cell when connected in series? A. Each cell has an electromotive force of 1·90 volts when freshly charged.

(5) J. J. R.—Make red copper or royal copper by boiling the articles in a nitric acid pickle (nitric acid and water). It is not unusual to have insulated material, that is, a conductor, or capable of receiving electricity, electrified by induction during a thunder storm, or if connected to the earth through water pipes, gas pipes, etc., to become charged with the opposite electrical conditions from the thunder cloud.

(6) J. B. H. asks: By what chemical reaction do the fumes of burning sulphur bleach apricots in drying? A. $SO_2+H_2O=H_2SO_4+2H$. The nascent hydrogen combines with the coloring matter, reducing it to a colorless compound.

(7) E. Mc. L. writes: Our brick house sweats and destroys the paper on the walls. What is the best remedy or best finish to use in such cases? A. Brush the wall over with a hot solution of ¾ pound of castile soap in 1 gallon of water; let it dry for twenty-four hours and then apply a solution of ½ pound of alum in 4 gallons of water.

(8) P. R. writes: 1. Please give me directions for amalgamating zinc plates for use in Smee batteries. I have an amalgamating solution that I made according to directions that I saw in a catalogue of electrical goods, but I think there is something wrong with it, for after plunging the plates (5×1½×$\frac{1}{10}$ inch) in it till the mercury will flow about on the surface, they will not last in a Smee or Bunsen battery on open circuit. They very soon become covered with a thick coating of a black substance, and waste away very rapidly. Will you please tell me why this is, and also whether or not they can be so treated that they will not corrode in sulphuric acid diluted with ten or fifteen parts by weight of water? A. We think the trouble is with your zinc. It is probably quite impure. Try immersing the lower ends of the zincs in a cup containing a small quantity of metallic mercury. The cup should be left in the battery cell to continuously maintain the amalgamation. Amalgamated plates on open circuit are apt to give more trouble. Short circuiting for a while will often improve them. 2. Also what is an "infernal machine"? A. An infernal machine is a device containing an explosive or highly combustible substance, and provided with a time exploder or igniter. 3. What is the cause of the beautiful play of colors in mother of pearl? A. The phenomenon is known as diffraction. It is the decomposition of the light by extremely minute grooves in the surface of the pearl.

(9) F. B. asks: 1. Can you give me a recipe for a good bichromate battery solution? A. Mix 100 parts of water with 12 to 20 of bichromate of potash in fine powder. Slowly add with constant stirring 25 parts of oil of vitriol. If you pulverize the bichromate, you should tie a cloth over your mouth and nose, as the dust if inhaled may produce ulcers. 2. How can I make a mould for casting battery zincs? A. Cast battery zincs in plaster of Paris moulds, or simply in clay, using a model of wood around which to form the mould. 3. How far apart should the zincs and carbons be in a bichromate battery? A. About ¼ to ½ inch. 4. Will placing a carbon on each side of a zinc, or zinc on each side of a carbon, give twice the current that a single zinc and carbon produces? A. It greatly reduces the resistance, which varies to a great extent in proportion to the areas of the plates that face each other. This improves the efficiency.

(10) W. C. C. asks: 1. State how invisible pictures on glass are made, those that are brought out by breathing on the glass. A. The design is drawn by etching slightly with hydrofluoric acid. See SUPPLEMENT, No. 378, for illustration and description of the process. 2. Is there a preparation of French chalk used in the process? A. Drawing with soapstone or French chalk forms an alternative way of making the design. 3. Can compound be put on with rubber stamp? A. You might experiment with rubber stamp. 4. Please give receipt for making a perfectly white slip, that will melt at low temperature, such as in tile kilns, etc. A. Take 3½ parts flint, 3 borax calcined, 1 Cornish stone, ½ oxide of tin. 5. Do you think the following storage battery will work? If so, how much current will be produced after storage? Lead shot in flat porous cell forming the negative pole and oxide of lead in same kind of cell for positive pole, in a weak solution of sulphuric acid cells, 4×7 inches, containing one pound each, all inclosed in wooden box. A. The resistance of your battery will be too high.

(11) S. B. S. wants (1) a good and easy recipe for making Seidlitz powders in small quantities. A. The proportions are as follows: Rochelle salts 2 drachms, soda bicarbonate 2 scruples put these into a blue paper and thirty-five grains tartaric acid in a white paper. 2. A recipe for making wax tapers. A. Wax alone being too brittle, the composition used is wax 8 parts, white resin 4 parts, tallow 2 parts, turpentine 2 parts. Description of process of making is too long to give here; you will find it in the "Techno-Chemical Receipt Book," page 388, which we can send you postpaid for $2.00. 3. A good recipe for making a stove polish. A. Mix 2 parts copperas, 1 of bone black, 1 of black lead, with sufficient water to make a paste. 4. How to make the tooth wash called sozodont? A. Take of potassium carbonate ½ ounce, honey 4 ounces, alcohol 2 ounces, water 10 ounces, oil of wintergreen and oil of rose sufficient to perfume. 5. A recipe for making a plaster good for drawing, healing, and strengthening purposes? A. Consult the U. S. Dipensatory. It contains recipes for many varieties of plasters.

(12) J. M. B. asks whether there is any way of tempering or hardening a saw smithing anvil, one that has been through a fire. A. If it has not been injured by being too long in the fire, so as to change the character of the steel by what is called burning, it can be rehardened; but it requires the experience of a person used to hardening. A good blacksmith should be able to do it.

(13) H. F writes: I have a German silver protractor 5 inches in diameter, graduated to ¼ degrees, but the lines are so fine that I can scarcely see them. Is there anything I can do to make them more clear? A. Make a little paste of lampblack, boiled linseed oil, and turpentine, and rub it across the lines with the finger, wiping off the excess from the surface. Or substitute vermilion for the lamp black, so as to get red divisions. If they are only fine and already filled with black, we can only advise a low-power magnifying glass.

(14) A. R. asks the medical use of milk in hydrophobia. It has been said that if dogs have plenty of new milk, they will not have the hydrophobia. Is this the truth? A. We cannot indorse the use of milk for rabies in dogs. The best thing to do is to kill the dog immediately, when symptoms of the disease manifest themselves. You will find interesting articles on this subject in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 63, 87, 125, 128, 137, 230, 276, 352, and 468. 2. The medical use of some of our vegetables. A. For the medicinal properties of vegetables you must consult some physician and works on materia medica. Their action varies with the temperament of different individuals.

(15) C. B. asks: What cheap article should I use to harden a body of plaster of Paris? A. Mix with alum water.

(16) T. D. desires (1) a recipe for curing deer skins so as to make them durable and pliant like soft leather. A. Wash the skin in warm water, and remove all fleshy matter from the inner surface; then clean the wool with soft soap and wash clean. When the skin is perfectly free from all fatty and oily matter, apply the following mixture to the flesh side: Common salt and ground alum ¼ pound each and ½ ounce borax. Dissolve the whole in 1 quart hot water and sufficiently cool to bear the hands; add rye meal to make it into a thick paste, which spread on the flesh side of the skin. Fold it lengthwise, the skin being quite moist, and let it remain for two weeks in an airy and shady place; then remove the past, from the surface, wash and dry. When nearly dry, scrape the flesh side of the skin with a crescent-shaped knife. 2. Tell me whether a panther skin can be cured and the hair left on? A. Yes; you may try the same as the above, or simply roll up with salt and alum rubbed well into the flesh side. Care must be taken to clean off all flesh and fat, and the skin needs to be well pulled and worked by a smooth and blunt tool.

(17) H. S. S. writes: A well is 700 feet from a house; the land at the well is 25 feet higher than at the house. The well is 35 feet deep. Now, with the pump (common force pump) can water be taken from the well to the house, the pump being at the house? A. It can. 2. Can ice be made on a small scale inexpensively? How? A. No. It requires an expensive machine. 3. How can drinking water be kept cool in warm climates? A. By placing it in unglazed pots, or in vessels wrapped in wet cloths, in a shaded place exposed to the wind. The evaporation of the exuding moisture cools the water, as practiced in Egypt and the Indies. 4. How can I take ink stains out of linen? A. Use a mixture of 2 parts cream of tartar, 1 part alum; pulverize together and make a strong solution in water, saturate the stain for a few minutes and wash. If not entirely removed, a weak solution of oxalic acid may be applied for a minute, and wash.

(18) L. W. asks a receipt to make Worcestershire sauce. A. Mix together 1½ gallons white wine vinegar, 1 gallon walnut catsup, 1 gallon mushroom catsup, ½ gallon Madeira wine, ½ gallon Canton soy, 2½ gallons moist sugar, 19 ounces salt, 3 ounces powdered capsicum, 1½ ounces chutney, ¾ ounce each of cloves, mace, and cinnamon, and 6½ drachms asafœtida dissolved in 1 pint brandy, 20 above proof. Boil 2 pounds hog's liver in 1 gallon of water, adding water as required to keep up the quantity, then mix the boiled liver thoroughly with the water, strain through a sieve, and add this to the sauce.

(19) E. A. L. asks whether borax, and also whether the silicates of sodium and potassium, when fused, are decomposed by an electric current of not more than 20 volts pressure. What compound substances (if any) resist, when fused, a current of above strength? A. An electric current of 20 volts potential will decompose any chemical compound under proper conditions.

(20) B. F. M. asks: What facing must be used in moulding brass in order that the castings shall be bright brass color when made? A. Use pulverized charcoal. There is an art in producing bright color in brass castings, independent of the method of moulding. It consists partly in timing the opening of the moulds and quickly cooling the castings in water before they have time to oxidize.

(21) H. E. D. asks: With what size wire should the armature in eight light dynamo (SUPPLEMENT, No. 600) be wound for plating, and how should the machine be arranged? A. Wind field with No. 8 wire until full and armature with two layers No. 12 wire. Arrange in series.

(22) R. O. desires (1) the best receipts for stove blacking. A. Take 2 parts copperas, 1 part bone black, one of black lead, with sufficient water to make a creamy paste. 2. For stove pipe varnish. A. Take of asphaltum 2 pounds, boiled linseed oil 1 pint, oil of turpentine 2 quarts. Fuse the asphaltum in an iron pot, boil the linseed oil and add while hot, stir well and remove from the fire. When partially cooled, add the oil of turpentine. Some makers add driers.

(23) J. C. S. asks the formula for computing the horse power of ordinary cylindrical steam boilers. A. The nominal horse power of boilers is the effective fire surface in square feet, divided by 12 for large boilers (over 30 horse power) and 14 for small boilers. The effective surface is all the shell exposed to the fire or heat and two-thirds of the tube surface on the fire side.

(24) J G. Y. S. desires (1) the most practical and economical proceeding for taking away the smell, taste, and color from olive oil. A. Add bone or blood charcoal in powder, shake well and filter. 2. A receipt that is practical and economical for making black varnish for machinery and stoves. A. See answer to No. 22.

(25) J. McN. asks how many cells of Fuller's mercury bichromate of potassium battery will be required to operate a circuit of about two hundred feet which has on three bells of high resistance, eight ohms each I think, and a clock arranged to open and close the circuit, also how much the battery should be increased to operate five bells. A. Five cells would suffice for the first case and eight for the second. Owing to the high resistance of the bells, more battery would be advantageous.

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August 30, 1887,

AND EACH BEARING THAT DATE.

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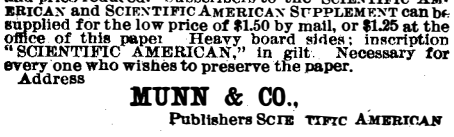

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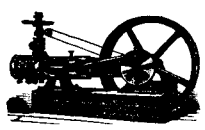

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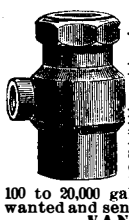

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Proposals for Steel Gun-Forgings for the Navy.

NAVY DEPARTMENT.
WASHINGTON, *August* 13, 1887.

Sealed proposals, from domestic manufacturers of steel, to furnish twenty-two sets of steel forgings for 6-inch B. L. rifle guns, all oil-treated, annealed, and in accordance with drawings and specifications prepared in the Bureau of Ordnance, will be received at the Navy Department until Tuesday, the 27th day of September, 1887, at 12 o'clock, noon, at which time the proposals will be opened.

The kinds of forgings required and the estimated quantities of each (aggregating about one hundred and thirty-six tons), are set forth in the specifications, which, together with blank forms of proposals and of contract, and copies of the drawings and any other information desired, can be obtained on application to the Bureau of Ordnance, Navy Department.

The contract will be awarded for the forgings as a whole. No proposal for less than the whole will be entertained, nor will any proposal be considered unless accompanied by satisfactory evidence that the bidder is in possession of a plant adequate to the production and delivery of the required forgings. All the forgings delivered under the contract must conform in material, manufacture, and quality to the aforesaid drawings and specifications, and must successfully pass the required inspection and tests.

The successful bidder will be required, within ten days after notice of award, to enter into a formal contract binding himself to deliver one set of gun-forgings not later than December 31, 1887, and not less than one set every twenty-one days thereafter, and to complete the deliveries within fifteen months from the date of the contract. A bond, in a penal sum equal to 15 per cent. of the total contract price, must accompany the contract.

Each proposal must be accompanied by a certified check, payable to the order of the Secretary of the Navy, in an amount not less than 5 per cent. of the total amount of the bid. Checks of unsuccessful bidders will be returned within five days after the bids are opened. The check of the successful bidder will be returned when he shall have executed the formal contract and furnished the requisite bond. In case of his failure to comply with this stipulation, the check will become the property of the United States.

All proposals must be in duplicate, enclosed in envelopes marked "Proposal for Steel Gun-Forgings," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

The right is reserved to waive defects in form and to reject any or all bids.

WILLIAM C. WHITNEY,
Secretary of the Navy.

Proposals for Steel-cast Guns for the Navy.

NAVY DEPARTMENT,
WASHINGTON, D. C., *June* 23, 1887.

Under authority conferred by the act of Congress, approved March 3, 1887, making an appropriation "for the purchase and completion of three steel-cast, rough-bored and turned, six-inch, high-power rifle cannon, of domestic manufacture, one of which shall be of Bessemer steel, one of open-hearth steel, and one of crucible steel," sealed proposals from domestic manufacturers, to furnish the same, will be received at this Department until Tuesday, the second day of August, 1887, at 12 o'clock noon, at which time the proposals will be opened.

Proposals may be made either to furnish three completely finished six-inch, breech-loading, high-power rifle cannon, made from unforged castings, one of Bessemer steel, one of open-hearth steel, and one of crucible steel, or three unforged, rough-bored and turned castings for such cannon, of the same material, respectively, to be finished by the Department in accordance with the bidder's design.

* * * * * * *

No gun or casting for a gun will be paid for until the gun "shall have been completed and have successfully stood the statutory test required by the act of July twenty-sixth, eighteen hundred and eighty-six," entitled "an act making appropriations for the naval service for the fiscal year ending June thirtieth, eighteen hundred and eighty-seven, and for other purposes." [For statement of requirements of said tests, and of other conditions to be observed, reference is made to "specifications" which can be had upon application to the Department.]

Proposals may be made for one or more guns or for one or more castings as aforesaid, * * * [but must be made separately for each gun, or casting for a gun, and upon forms prepared by the Department.]

Each successful bidder will be required to execute within fifteen days after notice of award, a formal contract in accordance with his proposal, and to furnish a bond, with satisfactory sureties, in a penal sum equal to fifteen per cent. of the amount of his bid, conditioned for the faithful performance of such contract.

Copies of the specifications, with blank forms of proposals, and all additional information desired, can be obtained on application to the Bureau of Ordnance, Navy Department.

All proposals must be in duplicate, inclosed in envelopes marked "Proposals for Steel-cast Cannon," and addressed to the Secretary of the Navy, Navy Department, Washington, D.C.

The right is reserved to waive defects in form and to reject any or all bids.

WILLIAM C. WHITNEY,
Secretary of the Navy.

NAVY DEPARTMENT,
WASHINGTON, D. C., *July* 20, 1887.

In order to give more time to domestic manufacturers to consider the matter, the period limited for the reception of proposals for steel cast guns is hereby extended, and such proposals will be received, under the foregoing advertisement, as modified, until Tuesday, September 20, 1887, at 12 o'clock noon, at which time the proposals will be opened.

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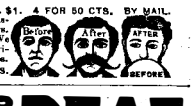

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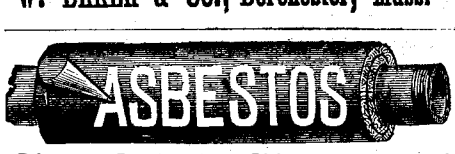

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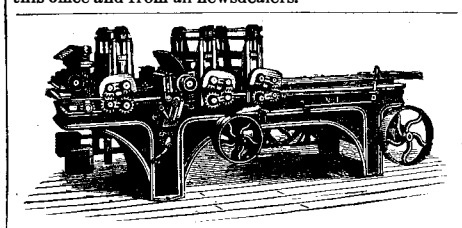
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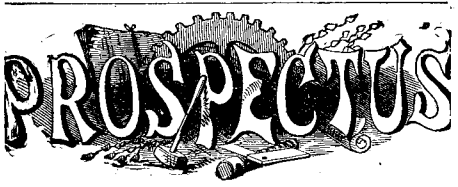

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